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Colon Hygiene

Comprising New and Important Facts Concerning the Physiology of the Colon and an Account of Practical and Successful Methods of Combating Intestinal Inactivity and Toxemia

By

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Thirty-first Thousand

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PREFACE

That most despised and neglected portion of the body, the colon, has in recent years been made the subject of much scientific study and research, with the result that a lively controversy has been stirred up over the question as to whether this organ should be permitted to remain a part of the "human form divine," or whether it should be cast out as worse than useless and unworthy of a place in the anatomy of the modern *genus homo*.

Anatomists have declared the colon to be a useless appendage, a vestigial remnant left over from a pre-historic state. Bacteriologists have charged it with being an incubating chamber of poison-forming germs, a hold of unclean and hateful parasites, a veritable Pandora's box of disease and degeneracy. Surgeons have removed the offending organ, and thus proved that it may be dispensed with, and have claimed wonderful advantages from this abbreviation of the *primæ viæ*.

Barclay Smith, the great English anatomist, first suggested the uselessness of the colon. Metchnikoff proved that animals that possess the longest colons have the shortest lives, and announced that the colon

bacillus is the germ of old age. Sir William Arbuthnot Lane, an eminent London surgeon, cites a long list of grave maladies, ranging from hypochondria to rheumatism, cured by removal of this offending organ.

The war still wages. There are pro-colon partisans as well as anti-colon enthusiasts. One thing is certain, however, the colon can no longer be ignored. That this organ, or rather the morbid conditions that develop in it, plays a dominant rôle in the causation of a long list of the gravest and most common disorders, can no longer be denied.

In the treatment of every chronic disease, and most acute maladies, the colon must be reckoned with. That the average colon, in civilized communities, is in a desperately depraved and dangerous condition, can no longer be doubted. The colon must either be removed or reformed. From the beginning of the colon controversy and for many years before, the writer has been a very earnest student of the questions involved, and has formed very definite opinions, the validity of which he, together with his colleagues of the faculty of the Battle Creek Sanitarium, has had opportunity to test in the treatment of many thousands of sufferers from colon and colon-caused maladies. The writer believes that methods have been worked out by means of which the colon may be reformed and made to do its work efficiently, not only in or-

dinary cases, but in by far the great majority of those cases which are thought by enthusiastic colon surgeons to be suitable subjects for surgical treatment.

Until very recent years almost nothing has been known of the physiology of the colon. This part of the body has been almost a *terra incognita*. The physiology of digestion stopped at the ileocecal valve. How the colon dealt with its contents, how the very necessary act of defecation was performed, nobody knew. The discovery of the X-ray enabled Cannon and, later, Hertz to study the colon while in action in animals and man. Elliot, Keith and other anatomists studied the intestine in dogs, and finally Case, by perfecting the X-ray technic of colon examinations, completed the physiologic study of this previously neglected organ. The combined result of the extensive labors of these investigators has been a great flood of light upon some of the most obscure questions in physiology. These new facts, not yet known to the general public, have rendered the greatest service in the development of rational methods of dealing with that most common and most destructive disease of civilized peoples—constipation. The chief purpose of this work is to present in a popular way these new facts and the practical results to which they have led.

Forty years' experience and observation in dealing with chronic invalids, and careful study of the results

of the modern X-ray investigations of the colon, together with observations made at the operating table in many hundreds of cases, has convinced the writer—

1. That constipation with its consequences is the result of the unnatural habits in relation to diet and colon hygiene which prevail among civilized people

2. That patients are not constipated on general principles, but that there exists in every case of constipation some particular condition which is the immediate cause of the delayed intestinal movement, and which must be removed before definite relief can be obtained, and that in the great majority of cases this cause is mechanical in character, a fold, a kink, a redundancy, a contraction—in short, some real and tangible obstruction.

3. That practically every case of constipation is curable, and in all but exceptional cases without the aid of surgery. It must be added, however, that by cure is not meant the working of such a miracle that the colon will perform its function normally without attention to diet or other means which encourage colon activity, but rather that by observing certain rules and the faithful and continuous use of safe and simple means, the colon may be made to perform its functions in a regular and efficient manner, without the use of irritating laxative drugs.

If some of our recommendations at first impress the reader unfavorably, we ask only that judgment be suspended until the suggestion has been given a fair test in actual experiment. Every measure presented has been tested in the crucible of actual experience in hundreds of cases, and is the result of a long series of practical tests made for the purpose of determining the actual value of individual remedies and perfecting practical methods of relief.

If the reader misses the usual list of laxative drugs, old and new, the reason is simply that the writer regards all medicinal agents that force bowel action by irritation (wrongly termed "stimulation") as pernicious and, without exception, harmful, and to be used only as temporary or emergency measures. In the words of the eminent Professor Von Noorden, "Nothing is so bad as the chronic use of laxative drugs."

The reader is asked especially to note that no panacea is offered for colon miseries; there is no "cure all" for constipation. The way out of the slough of intestinal toxemia with its "biliousness," headaches, neurasthenias, and multitudinous maladies, is to be found only through living biologically, and making use of the "safe and sane" helps which recent scientific progress has provided.

In attempting to put into semi-popular form the scientific facts pertaining to the hygiene of the colon, the writer does not desire to convey the impression that the sufferer from severe constipation can safely undertake to act as his own physician. The purpose is rather to enable the patient who may read this work to co-operate intelligently with the wise up-to-date physician.

The reader's attention is especially called to the chapter on "The Bowel Habits of Uncivilized Man," which contains a fund of original information obtained at the cost of much effort, which is both highly interesting and instructive. The author desires here to acknowledge his obligations to some hundreds of medical colleagues who have devoted their lives to the noble work of carrying to heathen lands the blessings of modern scientific medicine and Christian civilization, and who have found time in the midst of their arduous labors to answer the questionnaire and have thus furnished the unique information presented in this chapter.

Preface to the Fifth Edition

Since the publication of the first edition of this work the somewhat revolutionary notions presented in its pages have become widely disseminated, and the methods suggested have been copied and even exploited by numerous specialists.

While there are still those who entertain doubts of the importance of the colon and colon poisons as factors in the causation of disease and who consider constipation a natural and innocuous condition, the number of these reactionary and benighted brethren is growing steadily less. The penetrating intelligence of Victor Hugo recognized the vicious character of the neglected colon even before Metchnikoff and Bouchard had exposed its malign and destructive influence upon every bodily function. Hugo thus picturesquely characterizes the colon: "The serpent is in man. It is the intestine. The belly is a heavy burden; it disturbs the equilibrium between the soul and the body. It fills history. . . . It is the mother of vices. The colon is king."

This view of the colon justified Sir Arbuthnot Lane's summary method of dealing with the problem by extirpating the organ. But we have in recent years learned that it is after all not the colon, but its contents that must be regarded as the disturbing factor. When

the colon contents are reformed by changing the flora so that putrefaction disappears, the disturbing poisons are no longer produced and the colon, even though considerably crippled by long abuse may cease to be a cause of offense. In a great proportion of cases change of the intestinal flora is accompanied by the disappearance of constipation, the colon acting efficiently under the stimulation of a normal aciduric flora.

Many additions have been embodied in the present edition which will add to the value of the work as a guide to the proper hygienic care of the colon and, it is hoped, will aid both the physician and the patient in battling against the most universal and perhaps the most pernicious of all the maladies which afflict civilized man.

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THE COLON

Ignoring technical anatomical details the food canal may be described as a muscular tube about ten times the length of the body, measuring the trunk from the top of the head to the end of the spinal column. The chief part is coiled up in the lower cavity of the trunk, below the diaphragm. The upper end of the canal is controlled by the circular muscle of the lips, which is brought strongly into play in whistling. The lower end is controlled by the anus, also a circular muscle but which acts both voluntarily and involuntarily. At other points along the canal, circular muscles are placed to regulate movements of the foodstuffs during the process of digestion. Both in health and disease these "food gates," as they may be called, have a most important relation to digestion that has not been fully appreciated until very recent times.

The upper end of the food tube is provided with a special apparatus, the mouth and teeth, for taking food and preparing it to undergo the various processes which are carried on in

the deeper parts. At the lower end of the canal is found a mechanism that is wonderfully designed to receive and discharge from the body the unused remnants of the food and other waste materials—the pelvic colon. Of this we shall learn more later.

The Structure of the Food Tube

In structure, the food tube consists chiefly of muscle and gland tissue. There are two sets of muscle fibres. One set, the outer, runs lengthwise of the canal; an inner, circular muscle structure surrounds the canal throughout its entire length.

Between the muscle layers is a layer of nerve cells and fibres. These are connected with the central nervous system, the brain and spinal cord, but are capable of acting independently.

The food canal is lined with mucous membrane, which presents at various points special groups of glands that produce some of the various digestive juices which act upon the food. The canal is covered through most of its course with a delicate membrane, the peritoneum.

The food tube is roughly divided into six parts—the mouth, esophagus, stomach, small intestine, colon and rectum. The intestine is attached to the spine by a membrane, the mesentery, in which pass the nerves and blood vessels which supply the canal.

The zoologist divides the alimentary canal into three parts. The first part extends from the mouth to the pylorus, or lower opening of the stomach. This part is known as the fore-gut. The second portion, extending from the stomach to the colon, is called the mid-gut. These three parts of the food tube have each a distinct function. The fore-gut receives the food and prepares it for digestion; the mid-gut digests and absorbs the digestible portion of the food and body wastes and disposes of them.

The colon may roughly be described as a muscular reservoir about five feet in length and an inch and a half to three inches in diameter. This reservoir is divided into four secondary reservoirs, the cecum, the transverse colon, the pelvic colon, and the rectum. The feces, in their preparation for discharge from the body, are passed successively from

one to the other of these reservoirs, pausing for a definite interval in each, with the exception of the last.

Normal Position of the Colon

When in its normal position, the colon begins at the lower right hand section of the abdominal cavity; its head, a pouch much broader than the rest of the colon, lies in the hollow of the right iliac bone. This is the cecum. The small intestine joins the cecum about an inch and a half above its lower part, leaving a shallow pocket, at the bottom of which is attached the appendix.

From the cecum the intestine ascends along the right side of the abdomen to the liver. This portion is the ascending colon. At the liver a rather sharp turn is made toward the left, the hepatic flexure.

From this point the colon passes across the body above the umbilicus, sloping upward toward the left side, where it lies in close contact with the spleen. This section is the transverse colon.

At the spleen the intestine makes a short turn, the splenic flexure, then passes down-

ward along the left border of the abdominal cavity to the hip bone (crest of the ileum). This is the descending colon.

Passing obliquely across the hollow surface of the left iliac bone, the large intestine, here called the iliac colon, reaches the upper border of the pelvic cavity. Here it forms a loop, the pelvic colon, which has an average length of a foot and a half, but which varies in length from six inches to nearly three feet (in conditions of disease). The pelvic colon and iliac colon together form the sigmoid.

The end of the pelvic colon joins the terminal portion of the intestine, the rectum, opposite the middle of the sacrum. The pelvic colon varies in position according as it is empty or filled. When empty, it falls over backward into the pelvis, and lies upon the upper part of the rectum. When it is in this position, a very pronounced fold is formed at the junction with the rectum, the pelvi-rectal fold, a factor in controlling bowel movements. When the pelvic loop is full, it rises and thus gradually obliterates the fold and so opens the passage to the rectum.

The rectum extends from the pelvi-rectal

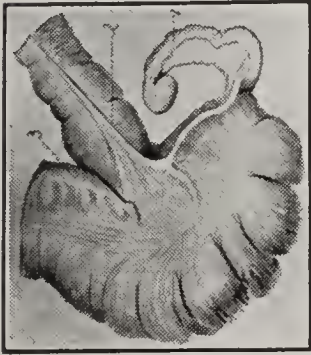
fold to the internal anal sphincter, being about six inches in length. In its upper part are two or three projecting folds of membrane known as Houston's valves.

The thicker muscular walls of the rectum are ordinarily contracted so that no cavity exists in the upper part, although some gas and often (in cases of disease) a considerable amount of fecal matter may be found in the lower part.

The distance between the internal and external sphincter is about one inch. This is the anal canal, which is always tightly closed except during defecation.

Just above the internal anal sphincter is found a series of raised points or papillæ, first described by Horner of Philadelphia many years ago. These papillæ are the terminal points of special nerves which when excited cause powerful contraction of the colon and the abdominal muscles and diaphragm, and at the same time a complete relaxation of the anal sphincter.

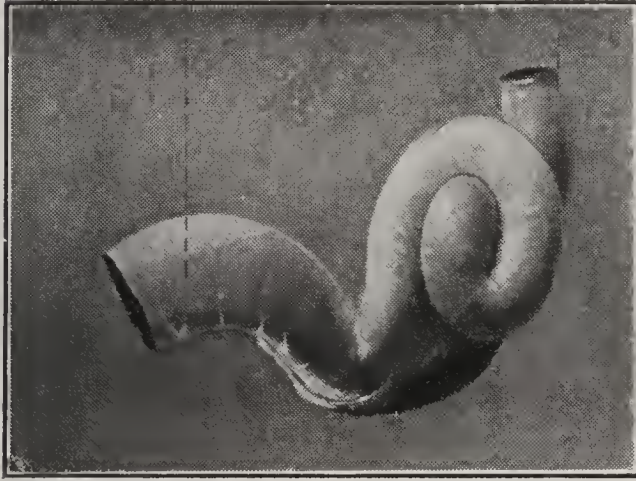
Here are also a number of shallow pockets in the mucous membrane, the follicles of Horner, whose function is to secrete a lubri-



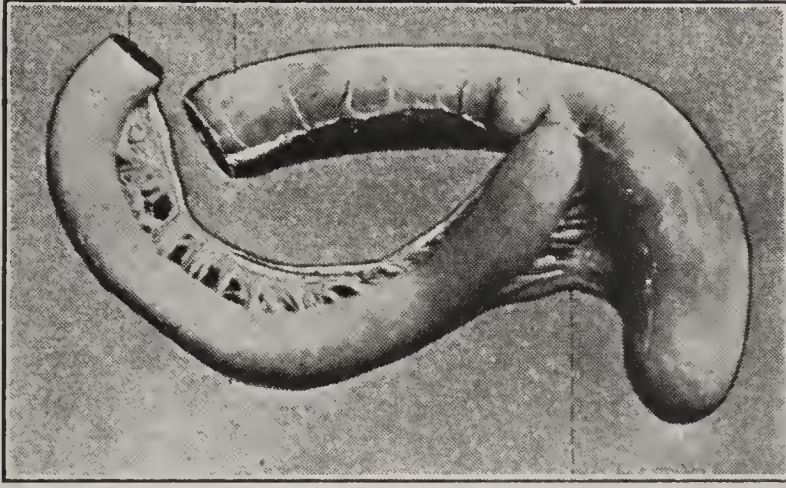
Cecum and Appendix
of a Chimpanzee



Colon of a Japanese
Deer



Cecum of a Dog



Cecum of an Opossum

SOME ANIMAL COLONS



Stereoradiogram of Normal Colon, Showing Pouches

cating mucus. Both follicles and papillæ sometimes become inflamed and a source of pain.

Surrounding the rectum are two muscles which act an important part in defecation, the levator ani muscles. In contracting, these muscles pull the anus upward and compress the rectum, and so squeeze out the last particles of fecal matter, leaving the rectum completely empty.

The small intestine is a smooth tube of uniform size, but the large intestine is sacculated. By a thickening of its muscular structures at intervals shallow pouches are formed in its sides. Along the outer surface of the colon run thick bands of muscle tissue which act in defecation like gathering strings. In contracting, these bands draw the lateral pouches together, so as to empty them of their contents. These sacs or pouches are well shown in the accompanying stereoradiogram, a rare view of the colon.

All parts of the large intestine, including the rectum, are supplied with two sets of nerves, one of which stimulates its muscles to contract, while the other exercises an opposite influence.

In the accompanying plates will be seen representations of the colons of different animals. It is especially interesting to note the close relation between the size of the colon and the character of the food in various classes of animals. In flesh-eating animals the colon is always short; in vegetable eaters it is long as compared with the body length.

Several authorities have reported observations on human beings which are quite in accord with the above facts. For example, an observer reports that a certain Asiatic people, whose diet has for centuries been strictly vegetarian, have longer colons than those of the Eskimos, whose diet is almost exclusively meat.

THE PHYSIOLOGY OF THE COLON

The chief use of the colon is to receive and discharge unusable waste matters, a sort of human garbage box. On this account, perhaps, this part of the food tube has been habitually neglected. It has been regarded as of little consequence. But modern studies of this part of the intestine have shown that by neglect this temporary reservoir of wastes may become a veritable breeding place of miseries and maladies almost too numerous to mention. So many and so serious are the disorders of mind and body which are now traceable to this part of the food tube, that not a few eminent surgeons have advocated and practiced the actual removal of the colon in cases of chronic disease of various sorts, and in many instances with surprisingly good results.

Professor Metchnikoff, of the Pasteur Institute, Paris, Dr. Arbuthnot Lane, head surgeon of Guy's Hospital, London, Dr. Barclay Smith, and numerous other scientific men, em-

inent bacteriologists, physiologists, anatomists and surgeons, have even announced the belief that the colon is a useless and often dangerous structure and that it may be advantageously dispensed with.

The writer does not accept this view, but holds with Professor Keith, the eminent English anatomist, that the evils attributed to the colon are really due to the adoption by man of a dietary unsuited to his anatomy. All vegetable-eating animals have long colons, as has man. The presumption is that a vegetable diet requires a long colon. Meat-eating animals, as the dog, have short colons. The frog while in the tadpole state is a vegetable feeder and has a very long colon. The adult frog feeds upon flesh and has a very short colon.

The Wrong Use to Which We Put the Colon

The trouble with the civilized colon is not that it is too long, but that it is put to a wrong use. Civilized man has adopted the diet of the dog while having the colon of the chimpanzee. It may be admitted that if a man is

to feed on the diet of the dog he ought to have his colon abbreviated. This is, in fact, the only way in which he could avoid a dangerous biologic misfit.

It is hardly to be supposed, however, that Nature has made so grave an error as to give to man an organ which is not only a useless appendage, but at the same time a prolific source of mischief. It seems more rational to believe that if the colon, an organ useful under normal conditions of life, is found to be so great a source of mischief in our civilized life, it is because of abnormal and pernicious habits or other influences connected with the life of the average civilized man.

The remedy is to be sought then, not in the extirpation of a portion of the body, but in a correction of those habits of life in which there has been a departure from the condition normal to the human species, and a return to practices and conditions which are physiologically and biologically correct for the *genus homo*.

The Colon a Waste Receptacle

One important function of the colon is to receive and to discharge from the body the unusable residue of foodstuffs. If these foodstuffs are of such a nature that they readily undergo putrefaction, as do meats of all sorts, the colon contents will become highly putrescent, offensive and poisonous, while still in the body. A milk-and-vegetable diet on the other hand furnishes a residue which does not readily putrefy, but ferments, forming harmless acids which aid bowel action. Hence the colon is not out-of-date, as its critics have suggested, but is only made to appear as a misfit by the adoption of a diet which belongs to meat-eating or short-colon animals. This view, maintained for many years by advocates of the biologic diet, is so eminently reasonable that it cannot fail to be accorded due recognition since it is now supported by so eminent an authority as the world-famous anatomist, Professor Keith, of England, who insists "the fault is not with the engine, but with the fuel."

Another important function of the alimentary canal, one which is quite distinct from its

function as a digestive apparatus, is its excretory function. The intestine is the outlet of the bile, from fifteen to twenty ounces being poured into the upper end of the small intestine every twenty-four hours. The bile is the most poisonous of all the bodily secretions, being, according to Bouchard, six times as poisonous as urine. It is through the bile that the body rids itself of alkaline wastes, some of which are highly poisonous in character.

Another fact of very great importance is that the intestine is itself an excretory organ. Certain poisons are excreted by the stomach, others find their way out of the blood through the walls of the gall-bladder and the small intestines.

The colon forms a receptacle for all these waste and excretory substances, together with the unusable or undigested residues of the food. But the collection of these waste matters is only an incidental function of the colon, its really important function being to conduct these waste and unusable matters out of the body.

The Colon Absorbs Little

The food normally enters the first part of the colon, or the cecum, in a nearly fluid state, its composition being ninety per cent water, and only one-tenth solid matter. During the passage of the foodstuffs through the twenty-two feet of small intestine, the digestible starches, fats, and proteins are rendered soluble by the digestive fluids, and are practically completely absorbed. The solid parts left consist almost entirely of indigestible remnants of foods, waste products excreted by the liver and the intestinal mucous membrane and microbes which are produced in great numbers in the lower part of the small intestine as well as in the colon. The small intestine is not only the seat of the principal digestive processes, but is also the principal organ of absorption of the digested foodstuffs. The colon normally absorbs only about one-sixth of the water which remains in the material received from the small intestine, the amount of which is estimated at about half a pint, and practically none of the foodstuffs. The small intestine absorbs daily five or six quarts of

liquids and all the products of digestion. It is, in fact, the one great avenue for the intake of nutrients, both solid and liquid.

About four hours after a meal, bubbling and squirting sounds may be distinctly heard when the ear is placed over the right lower abdomen, and an hour or two later it is easy to produce splashing and gurgling sounds by intermittent pressure over the colon low down in the right side of the abdomen, showing that a considerable amount of fluid has passed from the small intestine into the cecum. It should be remembered that this is not a mere mechanical process. The fluid food does not pass by gravity from the small bowel into the large intestine as water might trickle from a pipe into a reservoir. The opening of the small intestine into the colon is controlled by a sphincter, the ileocecal valve. This circular muscle holds the food in check in the lower part of the small intestine long enough to make sure that digestion is complete and the absorption of digested foodstuffs practically finished. In other words, the ileocecal valve is a sort of second pylorus, and serves much the same purpose.

The pylorus and ileocecal gates hold back solid and imperfectly digested foodstuffs, permitting the fluid portion to pass on. In the cecum and ascending colon the food is detained by reverse peristalsis, so that its fluid portion may be absorbed, thus increasing the consistency of the bowel contents. Gradually a portion of the water is taken up by the absorbents, which are very numerous in this part of the colon, and at regular intervals the more solid portions are pushed along toward the upper end of the ascending colon, the fluid part dropping back into the cecal pouch for absorption.

The Digestive Tract Compared to a Railroad System

Keith, the eminent English anatomist, has recently pointed out new facts of great interest in relation to the control of the movements of the alimentary canal. Keith has shown that the muscular structures of the intestine have the same property of rhythmic action as is possessed by the muscle fibres of the heart. This tendency to rhythmic movement of the individual fibres is organized into an orderly

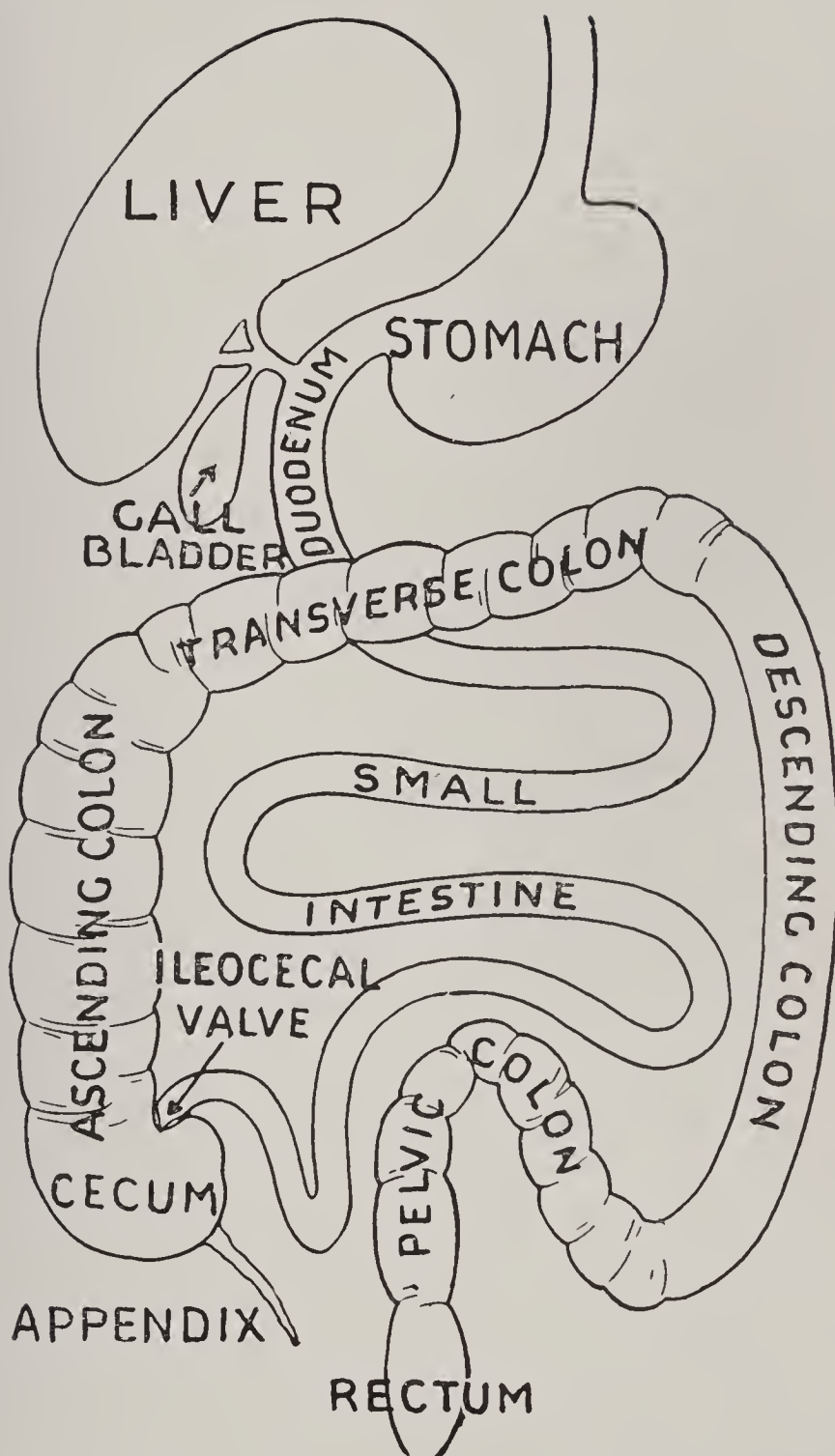


Diagram Showing Normal Colon and
Ileocecal Valve

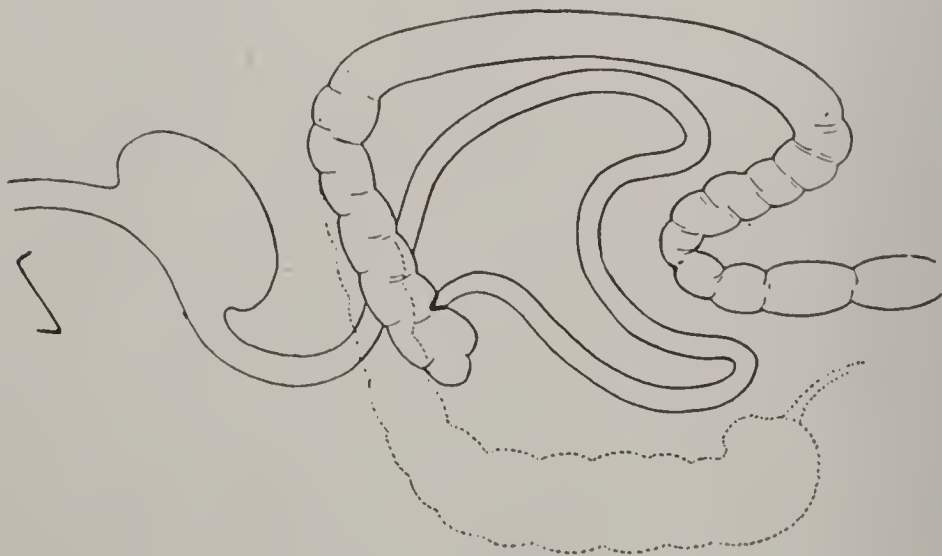


Diagram Showing Right Half of Colon
Removed

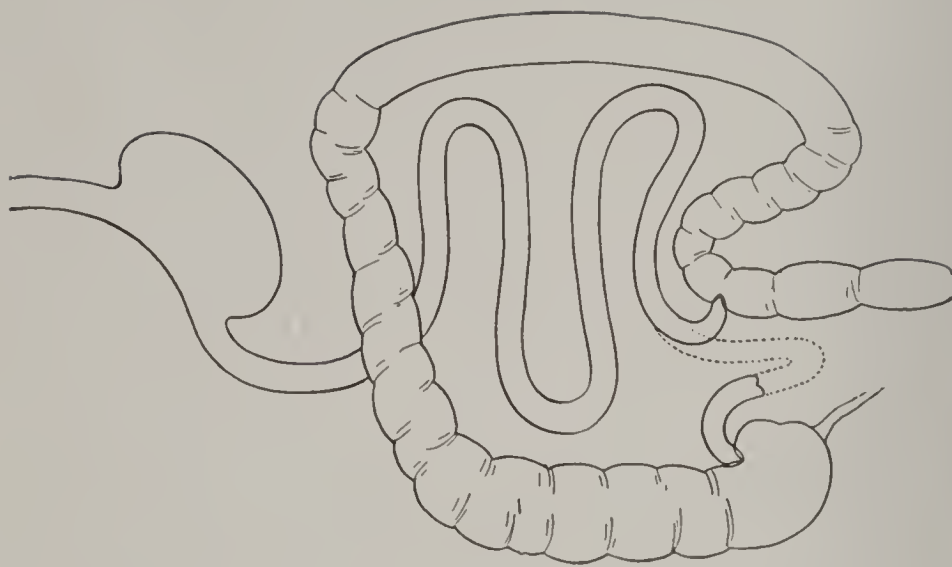


Diagram of "Short-Circuited" Colon

action by certain centers or nodes which are designated as pace makers. These nerve centers are placed at intervals along the alimentary tract, thus dividing it into sections.

Each section is separated from the next one by a circular muscle or sphincter. By this arrangement the activity of each section in manipulating the food and passing it along is more or less independent, as the sphincter muscle prevents the contraction waves from passing from one section into another. According to Dr. Keith, each section is, like the heart, supplied with a controlling nerve center or "pace maker." From this center arises periodically an impulse which maintains a rhythmic action of that particular part of the muscular tube which it controls. Four such nerve centers have been definitely located and studied. This new conception of the intestinal tract set forth by Dr. Keith compares the intestinal canal to a railroad which is divided into block sections, each section being controlled by its own signal man and telephone. The signal man of one section refuses to allow a second train to enter his section until it is cleared by the passage of the train then pres-

ent into the section beyond. If a section anywhere becomes blocked notice is sent back to the section behind so that traffic is stopped all along the line. This explains the lack of appetite, nausea, regurgitation of food, vomiting of bile and other unpleasant symptoms which often accompany colitis and spastic constipation.

According to Dr. Keith, the mouth constitutes the first section, defined by a sphincter at the upper end of the esophagus. At the lower end of the esophagus where it joins the stomach is a second sphincter. The pylorus is the third sphincter. Still another sphincter is found at the junction of the duodenum and the small intestine. The fifth sphincter is found at the end of the small intestine just above the ileocecal valve. Near the middle of the transverse colon is a sixth sphincter. At the junction of the colon with the rectum is found a seventh sphincter. The sphincter ani, which closes the lower end of the intestine, is an eighth sphincter. Each of these sphincters is controlled by a special nerve supply.

A disturbance of any one of these sphincters

may produce disorder all along the line of the alimentary canal. For example, a spasm or undue contraction of a sphincter may stop the action of all the parts above it.

Movements of the Colon

Like the stomach, the colon has movements peculiar to itself,—four very distinct modes of contraction. These are:

1. *Molding movements*, by which the contents are slowly compressed and molded. These movements are almost too slow to be noticed by the eye in X-Ray examinations except by observations made at intervals of a half hour or more.

2. *Propulsive movements*, by which the colon contents are passed along so rapidly that the eye cannot follow the movement. Movements of this sort occur regularly when the bowels are evacuated and also at other times.

3. *Snake-like movements*. Roeder, of Germany, has recently described movements in which the transverse or free part of the colon moves about in a manner closely resembling the contortions of a serpent. From this he concludes that the position of the trans-

verse colon, unless it is held fast by adhesions, is not a definite one and is not a matter of much importance.

4. *Reverse Peristalsis*. Anti-peristalsis, that is, a reverse movement of the intestine, was first observed by Jacobi, more than twenty years ago, and has more recently been studied in cats by Cannon. These movements occur systematically while the contents of the cecum are fluid in character, and serve both to prevent sudden and frequent discharge of the bowel contents, as in diarrhœa, and also to churn the contents of the cecum, thus bringing every portion in contact with the walls of the gut, so that absorption may be assisted.

As studied in animals, by Cannon, and in human beings by Case, the rhythmical reverse movements which occur in the colon, never in the small intestine, are interrupted at regular intervals by a downward peristalsis.

The tight closure of the ileocecal valve alone prevents the liquid contents of the cecum from being forced by the anti-peristaltic waves backward into the small intestine. At intervals the anti-peristaltic waves cease momentarily, while the ileocecal valve relaxes,

and small portions of material are passed into the cecum from the small intestine; then the anti-peristaltic waves again begin, churning the liquid material, spreading it over the surface of the cecum and ascending colon, thus encouraging absorption, while at the same time exerting a pumping action upon the venous and lymphatic vessels, so that the contents of the cecum are rapidly dried down to the proper consistency.

It is very probable that the common practice of resisting the "call" of Nature for evacuation, may have produced abnormal conditions of the colon, by which its normal functions are obscured to a very considerable degree. The theory of anti-peristalsis, first suggested by O'Bierne, accords well with the facts of clinical experience, and may now be recognized as a fully established fact, especially since anti-peristalsis has been actually observed in man by Case on numerous occasions, in the X-ray department of the Battle Creek Sanitarium, and by other observers elsewhere. Grützner has shown that antiperistalsis waves beginning in the colon may travel backward to the stomach.

Discharging Function of the Pelvic Colon

The pelvic loop of the colon, which, with the iliac colon forms what was formerly known as the sigmoid flexure, constitutes the motive part of the mechanism by means of which the feces are discharged from the body. This loop of intestine, when empty, lies low down in the pelvis, the lower end of the loop where it joins the rectum being closed by a sharp fold. There may be a sphincter at this point, although not in a state of constant contraction. The loop fills from below as fecal matters gradually and slowly enter it from above. As it fills, the loop gradually rises, finally reaching a point at which the valve opens, so that the feces can enter the rectum. As the rectal walls become distended by the accumulation of feces, the defecation center is stimulated, and powerful nerve impulses are sent out, which cause the pelvic loop to contract, thus compressing its contents just as one compresses the contents of a rubber bulb by squeezing it with the hand. The contraction of the pelvic loop is normally so vigorous and complete that it is fully emptied of its

contents. The contraction of the descending colon at the same time is normally sufficiently strong to carry the contents of the descending and iliac colon into and through the pelvic loop, so that the left half of the colon, from the splenic flexure to the anus, is emptied in normal defecation. At the end of the contraction, the pelvic loop, or at least the mucous lining of the loop at its lower end, may be pushed down into the rectum like a piston, thus ensuring complete emptying of the rectum. The action of the pelvic colon thus resembles that of a bulb and piston combined, the upper part acting like a compressing bulb, while the lower part serves as a piston, thus forming a surprisingly effective mechanism for discharging the body wastes.

The Digestive Time Table

Careful and long-continued observations of the time required for the passage of food through the different sections of the alimentary canal, have secured very definite and exact information upon this very important subject, on which are based the figures given below.

The following table shows, according to Rosenheim, the time required for the food to reach the more important of the stations along the alimentary tube, reckoning from the time the food is eaten, since it is known that food begins to pass out of the pylorus very soon after the beginning of a meal:

Cecum	4 hrs.
Hepatic flexure	6 hrs.
Splenic flexure	8 hrs.
Iliac colon	9 hrs.
Pelvic colon	10 hrs.
Rectum	16 hrs.
Discharge of residues.....	18 hrs.

The X-ray shows that food often reaches the ileocecal valve within half an hour after it is taken into the mouth. It does not pass into the colon at once, however, but accumulates in the lowest coils of the ileum where it remains until digestion is completed and the digested foodstuffs absorbed. When this has been accomplished, the ileocecal sphincter relaxes at intervals, allowing portions of the unusable residues to pass into the cecum until the ileum is completely emptied.

The last of the food taken into the stomach does not reach the colon until the end of about nine hours from the time it is eaten. Thus, the entire meal should reach the pelvic colon, according to Rosenheim, at the end of about fourteen hours.

The delay of six hours in the pelvic colon seems wholly unreasonable and unnecessary. If the food can pass from the splenic flexure to the pelvic colon in two hours (Rosenheim) it would seem that it ought to be able to traverse the short pelvic loop in the same length of time, or less. The processes of digestion and absorption of digested products is completed before the splenic flexure is reached. The descending colon, iliac and pelvic colon, and the rectum, contain few absorbent vessels. The feces are ready for discharge from the body; what possible benefit can result from their longer retention? Putrefaction processes are actively at work producing ptomaines and other toxins in quantity. By absorption, these may become a source of enormous and irreparable mischief. Why should not the unusable food remnants, the wastes and microbes which constitute the fecal mass, be gotten rid

of as soon as possible when prepared for exit? Is it not more than probable that the lower part of the human intestine, which is most subject to the influence of voluntary interference, has been so long abused, discouraged and hindered that it has become abnormally slow and dilatory?

Evacuation of the Colon

The evacuation of the bowels is accomplished by means of seven distinct actions, three of which are voluntary and four automatic. Arranged in the order of natural sequence, the following are the several acts which together constitute normal bowel movement.

1. Descent of the diaphragm and compression of the bowels, accomplished by taking a deep breath.

2. Voluntary contraction of the abdominal muscles, increasing the compression.

3. Pressure of the thighs against the abdominal wall (the natural position in moving the bowels is not the sitting position, but a crouching or squatting position universally employed by savages and in pioneer rural communities).

The result of these three voluntary efforts is to force a portion of the contents of the pelvic colon into the rectum, the distention of which gives rise to stimulation of the defecation center of the sympathetic nervous system by means of which the four automatic movements in defecation are brought into action, consisting of the following:

4. Reflex contraction of the abdominal muscles, reinforcing the voluntary contraction.

5. Contraction of the colon; the descending and pelvic colons being chiefly active, though sometimes the whole colon contracts.

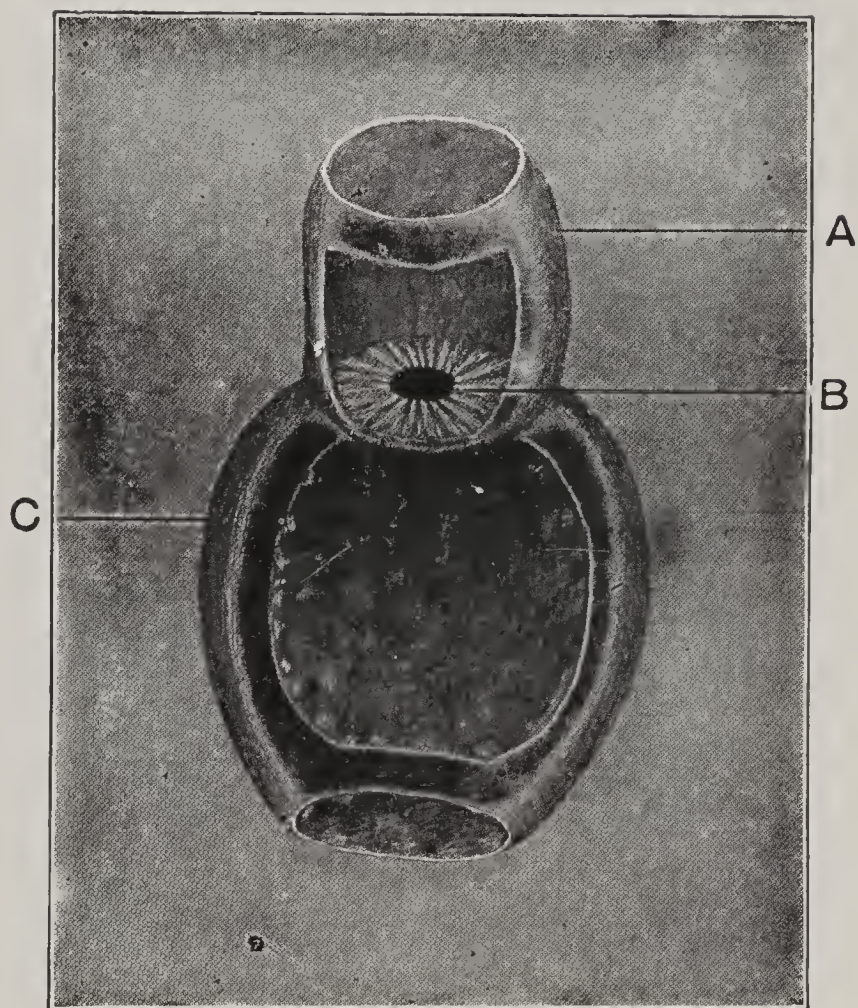
6. Reflex relaxation of the anal sphincter, in obedience to the general law which holds throughout the entire digestive tube, by virtue of which a wave of contraction passing along any portion of the canal is immediately preceded by a wave of relaxation.

7. Contraction of the levator ani, a muscle which surrounds the rectum and contracts at the end of defecation for the purpose of forcing out the last remnants of fecal matter, so that the rectum may remain empty until another movement occurs.

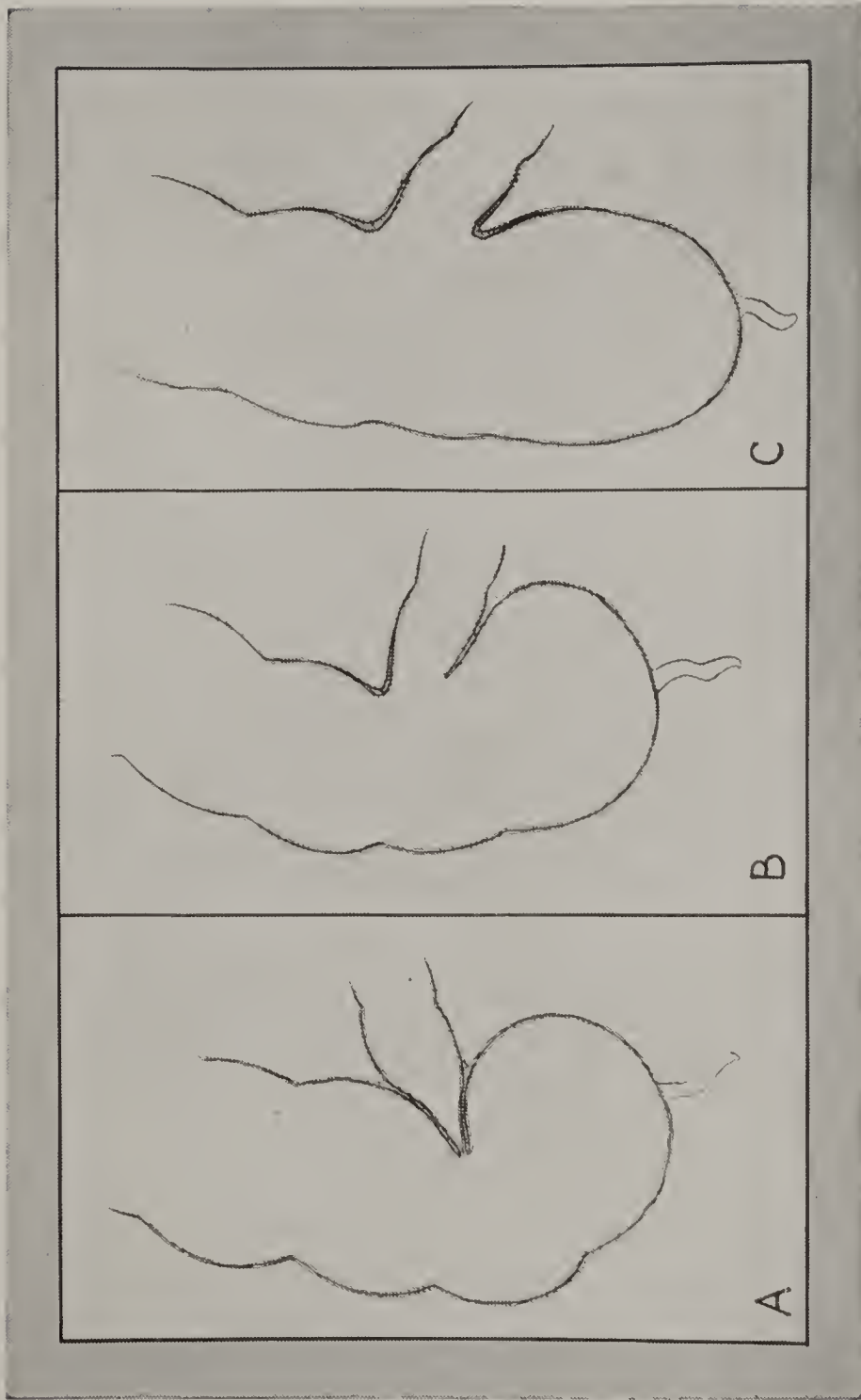
There are really eight steps in the defe-

cation process, if we include the preliminary filling and rising of the pelvic colon. A disturbance of any one of these eight factors in the process of defecation may result in constipation. If the diaphragm contracts insufficiently because of weakness, tight lacing, adhesions or any other cause, or if the abdominal muscles are weak, as is generally the case among civilized people, and if the position assumed in evacuating the bowels is such that the abdominal walls are not compressed by the thighs, the result may be that the rectum is not filled sufficiently to stimulate the defecation center, and so the reflex necessary to set in operation the automatic movements which empty the bowel, will not be produced.

If the distention of the rectum, as evidenced by a desire to move the bowels, is not relieved by going to stool, the desire for movement gradually disappears through the loss of sensibility of the rectal nerves, and the reflex is lost. The nerves which preside over reflex activities are easily exhausted by continued stimulation. Human physiology affords many examples of this principle.



Ileocecal Valve of a Conger Eel.
A. Ileum; B. Ileocecal Valve; C. Colon



A. Normal Ileocecal Valve. B. Partially Incompetent Ileocecal Valve.
C. Wholly Incompetent Ileocecal Valve.

THE ILEOCECAL VALVE AND ITS FUNCTION

This is an extremely interesting and important anatomical structure, which, though known to science for three hundred and fifty years, has received almost no attention until very recently. The ileocecal valve was discovered by Servius in 1563, A.D. It has been described by numerous anatomists, but was until recently regarded rather as an anatomical curiosity with no very important function.

The ileocecal valve consists of two parts—a sphincter muscle and a two-lipped check valve. The sphincter is formed by a thickening of the circular muscular fibres of the small intestine at its junction with the colon. The check valve is formed by an invagination of the small intestine into the colon. Something of an idea of the structure of the valve may be formed from the accompanying illustration.

Action of the Ileocecal Sphincter

Recent observations of Cannon have clearly demonstrated that the ileocecal sphincter acts in a manner very similar to the pylorus, retaining the foodstuffs in the small intestine until the digestive work of the mid-gut is complete and the digested foodstuffs have been absorbed.

Within the last few years Holzknecht, Schwartz, Groedel, Case, and numerous other roentgenologists have clearly demonstrated the functional activity of the ileocecal valve in controlling the movements of foodstuffs from the small intestine into the colon. These observations establish the necessity of the ileocecal valve for the following purposes:

1. To hold back the digesting material in the small intestine until the digested portion has been transformed by the several digestive juices, and absorbed.

2. To pass the mixture of unusable food residues, mucous, bile, and other excretions from the small intestine into the colon in small successive doses, so as to give the colon, the chief function of which is the absorption of

water and the discharge of unusable food residues and excreta, an opportunity to deal with the successive portions of material brought to it without being over-loaded.

3. To prevent a reflux of material from the colon into the small intestine, which is accomplished by co-operation of the muscular sphincter of the proximal side, and the mechanical action of the membranous folds on the distal side of the ileocolic junction. The importance of this function of the ileocecal valve is greatly emphasized by the demonstration, by Cannon, Schwartz, Case, and others, of the existence of an anti-peristaltic action in the first half of the colon.

Recent observations made by Boas and others show that a slight anti-peristaltic movement extending from the colon to the stomach is very frequent, possibly constant. Charcoal and various pigments introduced into the rectum at night in fasting persons may be found in the stomach the next morning. This anti-peristalsis is greatly increased by constipation and, when pronounced, gives rise to water-brash, nausea, "bilious attacks," vomiting, coated tongue and loss of appetite.

NORMAL BOWEL ACTION

There is perhaps no important bodily function so much neglected, and with such damaging results, as defecation or bowel movement. This function is too often looked upon as a humiliating act that must be secreted and avoided whenever possible, and that may properly be postponed to suit the exigencies of business or pleasure. The "call" of Nature for evacuation of the bowels is habitually ignored or resisted by children and adults alike, until it can no longer be suppressed, or until it disappears.

This wrong attitude toward one of the most important functions of the body is in large part responsible for the almost universal existence of constipation among civilized people, and of widespread and most appalling evil consequences, as we shall make clear in a subsequent chapter.

Ignorance of physiology, and especially of the physiology of digestion and nutrition, is doubtless the cause of this widespread evil. It is the duty of every physician and every

trained nurse to do all possible toward the enlightenment of the chronically sick with whom they come in contact in relation to the absolute necessity for frequent and complete bowel action.

This is a subject which is too commonly tabooed by a false modesty that is entirely out of place. Mothers and school teachers especially should give the matter special consideration. They should make sure that each child under their supervision has formed and maintains correct and regular habits in relation to evacuation of the bowels.

The Mechanism of Defecation

Until very recent times the process by which the colon discharges its contents was one of the most obscure in physiology. The discovery of the X-ray and of a method of examination by which the contents of the stomach and intestines could be made to cast a shadow on the fluorescent screen or upon a photographic plate, has thrown a flood of light upon this extremely interesting and practical question.

As already remarked, the process of defecation involves seven distinct acts. Three of these are under voluntary control, the other four being controlled by a special center known as the "center of defecation," located at the extreme lower end of the spinal cord.

The act of defecation is called forth by a sensation of fulness in the lower part of the colon. In a state of health we ordinarily perceive sensation only near the extremities of the alimentary canal. At the upper end of the food tube, guarding the entrance to the esophagus, there is located a reflex that controls the intake of food and liquids. There are nerves in the mucous membrane at the back of the throat that, when stimulated by the contact of foods or liquids, give rise to the swallowing movement in which the esophagus opens and food or liquid present in the throat is drawn in by a strong suction movement. The act of swallowing is impossible without the contact of something that may be swallowed.

At the other end of the food tube, within a few inches of the anus—that is, at the upper part of the rectum—are found nerves that,

when stimulated by the contact of fecal matters, give rise to a peculiar sensation recognized as a warning that the bowel contents should be discharged from the body.

The "Call"

Natural bowel movement is preceded by sensations which clearly indicate the necessity for evacuation of the bowels. The mechanism of this instinctive notification of the necessity for giving attention to the needs of the body is very interesting. We have already learned that the colon is subdivided into four separate compartments and that the feces are dealt with by each of these in succession. In the cecum the consistency of the feces is increased to such a degree that the mass can be handled by the muscular wall of the bowel. The ascending colon pushes the feces through the hepatic flexure into the transverse colon. In this horizontal portion of the canal the feces rest for a time for further extraction of water. From the transverse colon the feces are pushed up the incline to the splenic flexure, and through this narrow gateway into the descending colon, along which, in the course

of an hour or two, it finds its way to the capacious loop of the pelvic colon.

The pelvic loop gradually fills, and in filling is raised until the bowel is unfolded and thus opened. Now, unless the feces have been so long retained that they have become hard and dry, the bowel contents are pushed on into the rectum.

Up to this point the progress of the food material after leaving the mouth, during its passage through the long food canal, has been unattended by any sensation whatever. But now there is felt an unpleasant sense of weight in the region of the rectum. This sensation increases and there is a more or less urgent desire to evacuate the bowels.

This is the "call" of Nature for bowel movement, evoked by the contact of the feces with the nerves of the rectum and distention of its walls. The fuller the rectum becomes, the more pressing is the desire for evacuation. The "call" appears only when the feces have reached the rectum.

It will now be easily seen how the "call" and the bowel movement may be directly influenced by numerous factors. Let us briefly

notice some of the most important of these, which will be discussed more fully in a later chapter.

The taking of food is the most powerful of all natural stimuli of peristaltic activity. The taking of food, even in small amounts, starts up peristaltic waves which push forward the food residues in the lower part of the small intestine and carry them into the colon; and the fecal masses in the colon are pushed on to make room for other oncoming residues.

If the food taken is insufficient in bulk, the pelvic loop will be only partly filled, and hence will not rise high enough to permit the feces to pass into the rectum, and hence there will be no "call" and no movement. It is evident, also, that if the amount of food taken is small, the pelvic loop may be so long a time in filling that the feces which first entered will become so dry and compact that they may form a mechanical obstruction, and thus the onward movement necessary to reach the rectum will be prevented, even though the bowel may rise, and the gate which guards the entrance to the rectum may be open. In starva-

tion, no "call" appears because there is nothing with which to fill the loop and open the rectal gate.

Bodily movement has a certain amount of influence upon the position of the loop and the entrance of feces into the rectum, especially deep breathing exercises, and bodily exercises which produce deep breathing. In deep breathing, the diaphragm is pushed down upon the abdominal viscera, compressing the colon as well as other parts against the abdominal wall. By this means the feces in the pelvic loop may be pushed on into the rectum, thus evoking a "call."

The increased depth of breathing and the compression of the abdomen resulting from movement when one first awakens in the morning are no doubt the reasons why many persons experience a "call" almost immediately upon awakening after a full night's rest. During sleep the pelvic loop has been slowly filling and rising, but the pressure has not been quite sufficient to cause the feces to pass into the rectum. A push from the diaphragm and the abdominal muscles gives the little extra help needed and the "call" comes.

By straining movements, such as accompany bowel evacuation, sufficient fecal matter may be pushed over into the rectum to create an effective "call," when not previously felt. Hence the importance of going regularly to stool even though no "call" is experienced.

A cold morning bath helps in the same direction, both by causing deep respiratory movements, which increase the intra-abdominal pressure, and by causing a reflex contraction of the colon.

These facts are mentioned here in order to bring the explanation of the "call" within the range of common every-day experience, and to show its very important bearing upon the practical management of cases of constipation.

The act of swallowing a glass of water, especially the drinking of cold water, and above all other things the taking of food, by setting up peristaltic movements may produce a "call," provided there is at the time a quantity of feces in the pelvic loop. If the loop is empty, food taking or anything else which sets up intestinal peristalsis will serve to help the feces along toward the pelvic colon, thus

leading to a "call" a little later. The immediate effect of any such stimuli will of course depend upon the position of the fecal mass in the colon. If, for example, there is slight delay in the transverse colon, perhaps as the result of neglect of usual exercise or spending a day in bed, the use of measures to promote intestinal action may produce no immediate effect, whereas a bowel movement the next morning may be the result of the impulse given to the fecal mass by means of which the stagnation in the ascending colon was overcome.

The Lost "Call"

The "call" to bowel movement is like the call of the alarm clock set to awaken one in the morning. If not responded to, it soon ceases to be heard. It is like the voice of conscience, which may be wholly stifled by continued disregard. This is only the operation of a general biologic law. A continuous sensation which is ignored, by and by fades out of the consciousness. For example, the clothing gives rise to no sensation unless adjusted in some unusual fashion, although in

contact with almost the entire cutaneous surface. We are unconscious of gloves or shoes, although our hands or feet may be tightly compressed. So, if the 'call' evoked by the pressure of feces upon the nerves of the rectum is not responded to, after the lapse of a certain time the "call" is no longer heard. A mass of feces may lie in the rectum, but it produces no sensation. The writer has many times found large fecal masses in the rectum of which the patient was wholly unconscious, although in some instances there was evidence that they had been present in the lower bowel for days or even weeks.

The first time a "call" is disregarded it will return again when additional fecal matter is pushed down from the pelvic colon by the stimulus of the next meal, or as the result of some other influence which excites intestinal action or increases intra-abdominal tension. After having been disregarded or resisted many times, however, the "call" becomes less and less distinct, and by and by ceases entirely. The rectal nerves have lost their normal sensibility. They do not respond to the irritation produced by the contact of fecal matters, but

have acquired a tolerance for such contact, just as the nerves of taste may become accustomed to contact with hot spices, so that they no longer cause any disagreeable secretion, or the skin may cease to react to a mustard plaster, so that a stronger irritant, as croton oil or a hot iron, must be required to produce a blister.

This condition of lost sensibility is one of the most common causes of constipation, and a condition which is sometimes very difficult to remove, although always conquerable by persevering effort, thanks to the great light thrown upon these cases by modern medical research.

To lose one's "call" is almost as bad as to lose a fortune; indeed such a loss has more than once led to loss of fortune, and to worse results. A "call" that has been lost must be most assiduously sought for until recovered, and put into efficient operation. The methods for accomplishing this will be described at length in a later chapter.

Why Do the Bowels Move Periodically?

There are two factors which are chiefly active in producing bowel movements in normal individuals. The first is the practice of taking food only at stated intervals, regular meal hours. The second is regularity in the hours of sleep and morning rising. The omission of a meal, or a change in the hours of meals or of sleep will at once change or destroy the rhythm of bowel movements. Animals that eat continuously, as monkeys and barnyard fowls, have bowel movement many times a day.

The taking of food is the most active of all natural excitants of bowel action. When food is taken into the stomach, it produces powerful peristaltic waves which traverse the whole length of the intestine and carry the intestinal contents forward at a rate several times faster than the ordinary rate of progression; the larger the meal, and the more it is relished, the more pronounced is this effect. This explains the almost universal experience that the bowels move most freely and regularly soon after the morning meal.

On rising in the morning after a full night's sleep, so long a time has elapsed since the last bowel movement that the feces have accumulated in the pelvic loop and the descending colon, and it is only necessary that sufficient stimulus should be applied to cause feces to enter the rectum, and a "call" and bowel movement will follow. The act of rising, sometimes the mere awakening and the accompanying turning and stretching movements, are often sufficient to accomplish this. During sleep, the intestinal movements are slowed. The progress of the intestinal contents along the canal is at a much slower rate than during the waking hours. This is easily shown by X-ray observations after a bismuth meal. At the moment of awakening, all the bodily movements are quickened. The heart beats faster, the force of the breathing is increased, and the whole vital machine feels the impulse of quickened energies. If the pelvic colon has been slowly filling during the night, the various influences which are brought into play at the moment of awakening will be likely to cause the passage of a sufficient quantity of feces from the pelvic loop into the colon to produce a "call" and an evacuation.

The House-broken Colon

Regularity of bowel movement is of the utmost importance. It is a function which should be assiduously cultivated. As we have seen, the periodicity of alvine evacuation is not the result of any mysterious influence, but is a product of forces which are largely in our own control and are easily understood. From early infancy, the habit of prompt attention to the "call" for evacuation of the colon should be assiduously cultivated. Instead of doing this, the mother usually subjects the little one to a process of house-breaking much like that to which house dogs are subjected. The result is the derangement of the natural order which empties the colon after each meal or three or four times a day, and the establishment of a crippled condition of the colon which permits but one evacuation a day, a form of constipation which is so universal among civilized people that it has come to be regarded as natural. Indeed, the majority of people and many physicians regard regularity as the essential element of colon health, and almost ignore the matter of frequency and

thoroughness of evacuation. The late Sir Lauder Brunton, the eminent English internist, told of a lady who answered his inquiry about the colon function, "perfectly regular, sir, perfectly regular." When further questioned, she disclosed the fact that although bowel movements were perfectly regular, they occurred only once in three weeks.

As soon as the little one begins to run about, the mother begins to train it to restrain the movements of the bladder and bowels to suit convenience of time and place. A false sense of modesty also becomes a restraining influence which soon upsets the normal intestinal rhythm and lays the foundation for life-long stasis and constipation and all the miseries associated with these conditions and the auto-intoxication to which they give rise.

THE FECES

The composition of the colon contents, the feces, is very complicated and highly variable, depending very largely upon the character of the food. The bowel discharges of the nursing infant consist of fragments of undigested curds, fat, bile and a small amount of mucus. The odor of a healthy infant's stool is slightly acid, and yellowish in color. The stool of an adult who subsists upon an ordinary mixed diet contains a considerable amount of food residues, seeds and skins of fruit, cellulose from vegetables, and such whole-grain cereals as oat-meal and cracked wheat, and also contains one or two per cent of starch, about the same amount of fat, and three or four per cent of protein. Sugar is not present. The color is usually dark brown, often black, and the odor putrid. The form varies to a marked degree.

The stools of a person who subsists on a natural non-flesh diet and whose bowels move three times a day are very different from those of a meat eater and closely resemble

those of a healthy infant. The odor is not putrid, but may be slightly sour.

Strassburger has shown that about half the solids of fecal matter is made up of bacteria. When the stools are putrid it is because of the dominance of the special bacteria which give rise to putrefaction. In sour smelling stools, however, the bacteria present are chiefly those of the sort which cause fermentation and give rise to acid. The sour odor is due to the presence of acetic acid, which is more or less volatile at low temperatures. Lactic acid is also present. As it is non-volatile, its presence is shown only by chemical tests, not by the odor.

The general belief that the feces or stools consists chiefly of the unused remains of food-stuffs is entirely erroneous. As a matter of fact, even under the most unfavorable conditions, the feces contain really very little food material.

The chief constituents of the feces are as follows: bile, remains of digestive juices, especially of the pancreatic juice, mucus, excretory substances thrown off by the intestinal mucous membrane, microbes and various poi-

sons produced by microbes, such as indol, skatol, pyrrol, and numerous other poisons, together with some small amounts of the various food principles, and water.

The composition of the stool varies greatly according as the diet contains much or little of vegetables. On a vegetable diet the feces contain much cellulose, and with the cellulose are increased quantities of undigested protein and starch. The amount of fat does not vary much, and sugar is never present.

The weight of the feces varies with the diet, increasing with a vegetable diet, and diminishing with a diet composed chiefly of animal substances. Food which contains much cellulose passes through the intestine much more quickly than does animal food, and hence contains more water and undigested food principles. The total weight of the feces for twenty-four hours with a mixed diet is about five ounces, of which three-fourths is water. With a vegetable diet the weight is double, and the proportion of solid matter is slightly greater.

The Microbes of the Intestine

The reaction of the feces is neutral or slightly acid on a vegetable diet, and strongly alkaline on a flesh or mixed diet. This difference in reaction is due to the difference in the flora or species of bacteria which are present. Feces that are rich in protein, the result of a mixed or flesh diet, contain enormous quantities of putrefactive bacteria, which produce alkaline substances in decomposing the proteins—ammonia, ptomaines, and various toxins. When considerable quantities of starch are present, as with a vegetable diet, with very little protein, acid-forming bacteria are more numerous and the feces may have an acid or neutral reaction.

This difference in reaction is one of the most important of all the various characteristics of the feces, since it suggests at once the general character of the flora, and thus points to the toxic or non-toxic character of the stool. This remark does not apply, however, to butyric acid, which is often present in highly putrefactive stools, to which it gives a rancid odor.

Roger calls attention to more than one hundred and sixty different species of bacteria which have been found in the feces. Of these, more than one-third were found to possess pathogenic or disease-producing properties. Distaso points out more than twenty species of putrefactive bacteria which are found in the stools of flesh eaters, all of which produce very highly toxic products. One of the most common and abundant of these is the *Bacillus* of Welch, which produces enormous quantities of offensive gas and highly active poisons. This microbe, as well as the other putrefactive organisms which are found in the feces, is found in an active growing condition in butcher's meat and fresh flesh foods of all sorts, as well as salted and dried fish. These are doubtless the chief sources of the dangerous bacteria which carry on in the body the same putrefactive processes to which they give rise elsewhere. Welch's bacillus is the cause of gas gangrene.

The number of these microbes in the feces is something prodigious. They often constitute from one-third to one-half the total weight of dried feces. Strassburger estimates

the weight of the microbes produced in the intestines in a single day at not less than one-quarter of an ounce, and the number more than one hundred trillions, of which a large proportion may be poison-forming organisms. Only a small share of the bacteria are found alive in the feces (one per cent, according to Strassburger), but all have been alive and have each produced its portion of poisonous substances in breaking up the protein upon which it feeds.

The study of these bacteria is one of the most important fields of research at present before the bacteriologist; for it has been clearly shown that the condition of the flora of the intestine is one of the most important of all factors in determining health or disease, long or short life. Of this subject we shall learn more in a subsequent chapter.

Excretory Products

Not the least important constituents of the feces are the waste products which they contain, a fact quite too often overlooked. The mucous membrane of the intestine, like the skin, is an excretory organ. Although the

extent of the intestinal mucus covering is only seven square feet, about one-third of that of the skin, there is reason for believing that its importance as an outlet is fully as great as that of the skin, and probably much greater. This fact has only recently been made known. By the researches of Roger and others, it has been shown that the mucous membrane removes from the body some of the most deadly poisons which are produced in our tissues, or which may be introduced from without. If, for example, a quarter of a grain of morphia is injected underneath the skin of a person, a large part of the poison will be found in the stomach and intestine within a half hour. This excretion of poisons appears in the light of these new researches to be one of the important offices of the stomach.

Lime salts which are no longer needed in the body are excreted through the intestine.

The bile poured into the intestine contains some of the most deadly poisons produced in the body. These poisons are often concentrated by re-absorption, the natural result of constipation.

Examination of the Stools

When a doctor is called to see a sick infant, he first of all inquires as to the bowel passages, and the experienced nurse or mother always preserves the infant's napkins to show to the doctor when he comes. If the bowel passages have the usual consistency and yellowish color and a slightly acid odor, the doctor knows that there is no serious disturbance of digestion; but if the stools are dark or brownish in color and have a foul or putrid odor, this fact alone is sufficient to show to the physician or experienced nurse that the infant is sick. Any physician who would omit to examine the stools of an infant when called in consultation, would be regarded either as ignorant or as quite remiss in his duty.

It is very strange, indeed, that until quite recently almost no attention has been given to the stools of adults, and even at the present time physicians quite rarely take the trouble to make anything like a thorough investigation of bowel passages. The doctor usually contents himself by inquiring if the bowels move regularly. When ques-

tioned concerning the character of their stools, most patients are unable to give any information. Something can be learned from the general appearance of the stools, but for really useful information it is necessary to submit a specimen to a thorough laboratory investigation at the hands of an expert in this particular line of research.

It is not going too far to say that a thorough examination of the stools should be made in every case of chronic disease. This practice has already been instituted in a very few medical institutions where first-class medical work is done, and the time cannot be far distant when such examination will be a routine practice with all physicians who attempt to keep abreast with the advance of medical science.

Careful microscopic examination is of course necessary to determine the presence or absence of parasites. In the South, hookworm disease is not confined to the mountain districts. Evidence of the presence of these parasites has often been found in the stools of well-to-do people living in large Southern cities. The tapeworm parasite occurs in all

parts of the United States. Parasitic ameba are encountered with increasing frequency.

Most important of all for the average patient is the bacteriological examination. This should be made in every case of constipation, but not simply for the purpose of determining whether or not putrefactive changes, with the pernicious organisms which give rise to putrefaction, are present; for putrefactive organisms are dominant in all cases of stasis and constipation. The examination is to determine the degree of infection as shown by the relative proportions of acid-forming and putrefactive organisms. The gram stain is very useful for this purpose. In general, the greater the number of gram positive organisms, the better the flora.

A flora which gives with the gram stain 5 positive and 95 negative, is an extremely bad one. Such a flora will be highly putrid, alkaline in reaction, and will show great numbers of *B. Welchii*, *B. proteus* and other putrefactive organisms, and aciduric organisms will be absent. This is the sort of flora often found in cases of chronic rheumatism (osteoarthritis), gall bladder disease, chronic colitis or

appendicitis, premature senility, migraine and neurasthenia.

When a patient with such a flora, by proper diet and the use of lacto-dextrin changes his flora to such a degree that the gram stain is reversed, giving 95 positive and 5 negative, the picture changes completely. The stools are no longer putrid or ammoniacal, but become neutral or slightly acid in odor and reaction. *B. acidophilus* is dominant and *B. Welchii* and other spore-bearing organisms are absent. The bowels move better, are often loose instead of constipated and the patient usually feels an immediate and decided change for the better.

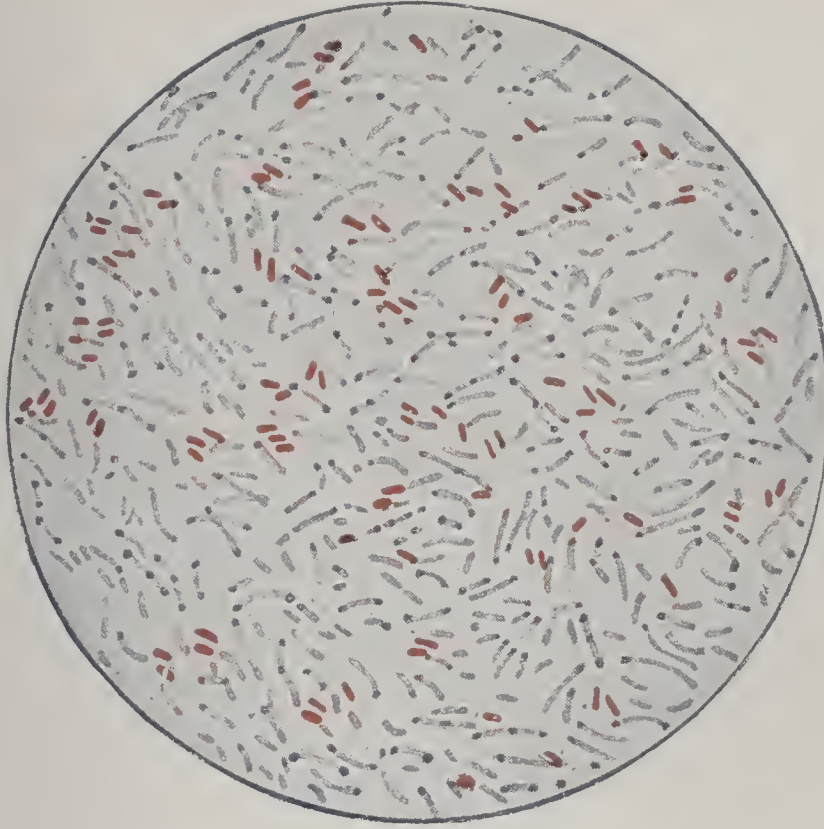
The accompanying cut shows the contrast between a gram positive and a gram negative flora as seen under the microscope. The organisms shown in red are putrefactive; the blue, acid-formers, chiefly *B. acidophilus* and *B. bifidus*.

A flora which shows gram positive 20 to 30 and gram negative 80 or 70, a very common finding, is the ordinary bad flora of mixed feeders. With constipation or stasis, such a flora becomes a grave cause of disease because

of the enormous burden thrown upon the liver and kidneys in the destruction and elimination of putrefaction products, some of which are highly toxic. As the flora is gradually changed to gram positive 75 and negative 25, then positive 80 or 90 and negative 20 to 10, the patient experiences progressive improvement in feeling and well-being. The bowels move better and all the bodily functions are better performed. A great handicap has been removed and the vital machinery has an opportunity for unhampered action. The curative forces of the body that before were occupied in battling against poisons absorbed from the colon and repairing the damages done by them, are now left unhandicapped for the task of correcting diseased conditions and restoring the normal vital equilibrium of health.



A



B

Colon Bacteria

The red color indicates species which produce putrefaction and give rise to toxins; the blue color, acid-forming organisms which are friendly. A. Stool from a child suffering from intestinal toxemia. B. Same case ten days later after flora was changed by a change of diet and other measures.

INFLUENCES WHICH EXCITE MOVEMENTS OF THE COLON

The food tube is controlled by two sets of nerves. One, the motor, excites contractions of the intestine, while the other opposes this action, causing cessation of movement and relaxation of the intestine. The motor nerves are derived from the brain and spinal cord; those of the second class, known as splanchnic nerves, from the sympathetic.

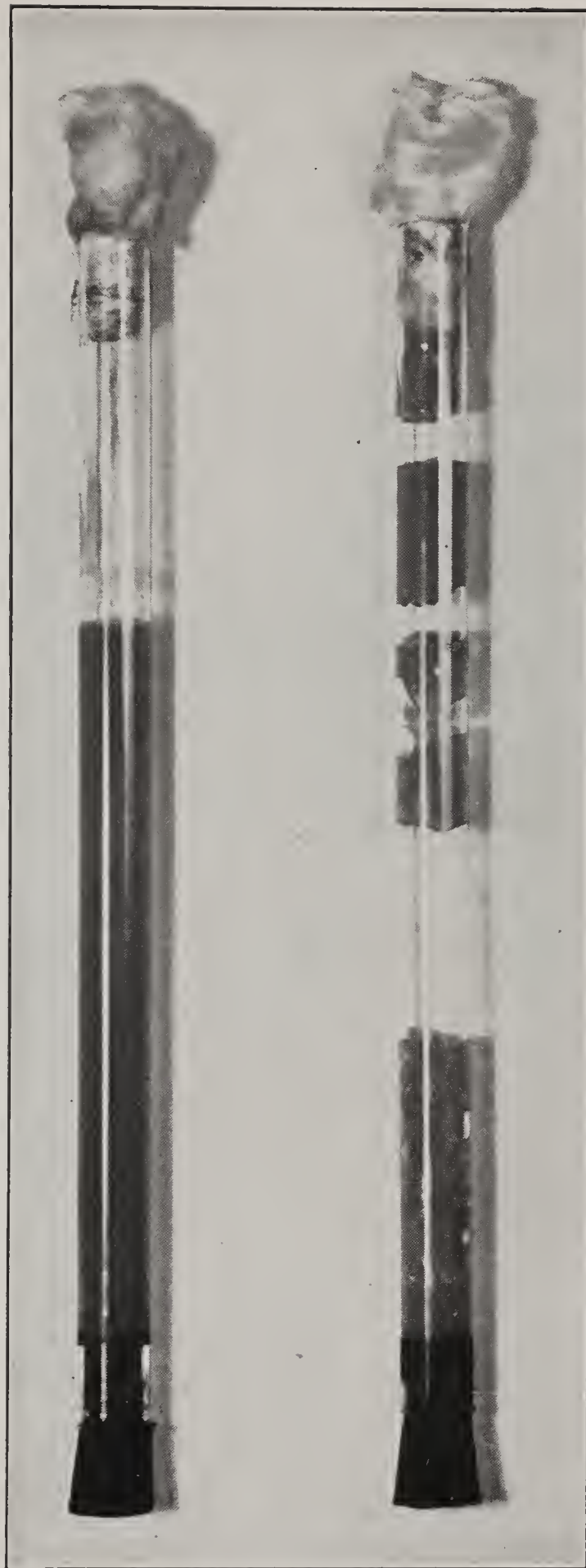
A very remarkable and interesting fact relating to the action of these nerves should be mentioned here as an aid to a full understanding of their action. When the motor nerves of the intestine are stimulated, they cause powerful contraction of both the intestine and the abdominal walls, but relaxation of both the internal and external anal sphincters. When the sympathetic or splanchnic nerves of the intestine are stimulated, they cause relaxation of the intestines, with cessation of movement, and at the same time strong con-

traction of the ileocecal sphincter. These two facts explain many important phenomena in relation to bowel movement and constipation.

The relaxation of the anal sphincters when the colon and abdominal muscles contract, is necessary to facilitate the discharge of feces from the bowels. This fact wholly agrees with the interesting observations of Bayliss and Starling, that mechanical excitation of the intestine causes contraction at and above the point of irritation, and relaxation below.

The intestine is supplied with nerve ganglia of its own, located within its walls, between its two layers of muscles. A small bit of stomach or intestine removed from a living animal, when stimulated by electricity does not contract in continuous spasm as do ordinary muscles, but contracts rhythmically.

A remarkable substance, pituitrin, produced by a small gland in the brain, the pituitary body, is a most powerful stimulant to the entire intestinal tract. Used hypodermically, this substance rarely fails to produce within a few minutes very vigorous bowel action. It is much used for this purpose after operations involving the abdomen.



A

B

Veillon Tube Cultures Showing, A. Flora Changed, No Gas;
B. Putrefactive Flora, Welch's Bacillus, Much Gas

The Influence of Bulk

The intestine has two special senses, the muscular sense, which it possesses in a very high degree, and a fine tactile sense located in its mucous lining. The muscular sense is excited by distension of the intestine, which causes tension of its muscular walls.

~ In operations upon the stomach and intestines, the influence of mechanical stimulation is often seen. Slight pressure or traction upon the wall of the stomach or of the intestine is sufficient to set up a contraction which follows in a few seconds. Contact of the food with the interior of the intestine produces like effects. The greater the bulk of the food, the greater the effect. As shown by Cannon, segmentation, a most effective means of food propulsion, becomes really active only when the bowel is distended.

Foods which are completely digested and absorbed by the intestine, leaving little or no residue, do not encourage peristalsis. This is the reason why rice, boiled milk, and fine flour bread have become generally known as constipating foods. These foods are not actively

constipating; they simply do not leave sufficient indigestible residue to afford the necessary mechanical stimulation of the intestine.

In general, all animal foods encourage constipation, for the reason that they are very completely soluble in the digestive fluids. Hair, feathers and bones are almost the only animal tissues not capable of complete solution in the digestive juices. It is in part for this reason that carnivorous animals usually eat bones with the flesh on which they feed; the bones are of course necessary also for the lime which they contain, and which is almost wholly lacking in the soft tissues of animals. Most carnivorous animals also eat more or less vegetable food. Cats and dogs often nibble grass, and special weeds, of which they appear to be extremely fond. Fowls swallow feathers and sand. Horses sicken when fed on corn alone. They must have a liberal supply of coarser material. A Maine ship captain saved a cargo of mules, when the supply of hay was swept overboard, by feeding them shavings made by the ship carpenters. A number of horses in the cargo refused to eat the shavings and died. In England, when the

price of grain is high, the farmers feed their stock treacle, which is very cheap, combined with wood sawdust, and with good results. The animals readily fatten on this diet, and remain in good health.

Most primitive people recognize the need of bulk to maintain healthy action of the alimentary canal. The Japanese and Chinese make large use of various seaweeds. One of these under the name of agar-agar has come to be well known in this country.

Agar-agar is prepared from a sea-weed that grows on the coast of Japan and Ceylon. It is sometimes known in commerce as Ceylon moss. It is also known as Japanese isinglass or vegetable gelatine. It does not, however, have the composition of gelatine. Its composition is practically identical with cellulose. It is almost wholly indigestible in the human alimentary canal. The commercial product is prepared by cooking the seaweed with much water in large kettles, then cooling the solution, and passing through colanders by which it is formed into long strings. These are dried in the sun, and then bleached in the sun and dew for several weeks. This mate-

rial is brought to the United States in large bales. In its commercial form, as it is obtainable at many drug stores, agar-agar is hardly fit to be placed in the stomach. It needs to be thoroughly washed and disinfected.

Mr. George Kennan, the celebrated Siberian traveler, stated to the writer that the Eskimos eat half digested reindeer moss as a remedy for and preventive of constipation. The moss is obtained by killing the reindeer at a certain time after feeding, removing the half-digested moss from the stomach, and submitting it to a very slight and simple preparation.

The natives of Japan and China eat quantities of dried raw turnip, bamboo sprouts, lily flowers and roots and other vegetables and "greens" of many sorts with the rice which forms the staple food of these people.

The Alaska Indians gather and dry a seaweed which is used in its native state by these people to prevent the constipation which would naturally result from the nearly exclusive fish diet on which these Indians are compelled to subsist at certain seasons of the year. The sea-weed is simply gathered and dried

in the sun and pressed into large flat cakes between flat stones. The material thus prepared is very black in color but is crisp and not unpleasant in flavor. Natives of Peru make use of dried kelp, a common seaweed.

The Hopi Indian makes a good laxative food by grinding up in a stone mortar the whole nut of the pinon, including the shell.

The Highland Scotchman escapes the constipation which would otherwise result from his diet of buttermilk, oatmeal and potatoes, by eating his brose (oatmeal) in a half raw state—simply scalded instead of boiled.

The wild Arab supplements his diet of camel's milk and dates with wheat ground in a stone mill, which supplies all the cellulose of the bran, with the addition of a certain amount of pulverized stone.

The Orinoco Indians and the poor whites of the Tennessee Mountains combat constipation by eating considerable quantities of clay, as do horses and other animals when fed on a too concentrated diet.

The desire for bulky green things, which afford much bulk with little nourishment, that almost every one experiences in the early

spring time, when the oncoming heat reduces the bulk of the food by lessening the appetite, is an instinctive prompting which cannot be disregarded without injury.

A western pioneer, who was shut up in the mountains of the Coast Range by an early fall of snow, and confined for three months with several companions and a number of mules with no food but corn meal, escaped without injury, although his associates all suffered extremely, by following the example of the mules, who dug tunnels in the fifteen-foot snow drifts and ate the grass hidden underneath.

A diet consisting largely of meat, eggs, milk, cane sugar and fine flour bread, leaves little or no residue to act as a stimulus to the intestinal muscles. The free use of greens and salads of lettuce, cabbage and other uncooked foods fresh from the garden is essential to healthy intestinal activity.

Other elements of the food besides bulk, exert a marked influence upon the activity of the digestive organs. All the sugars stimulate intestinal activity. Roger thinks this action is confined to the small intestine, but in this he

is in error, for every abdominal surgeon knows the remarkable laxative effects of an enema consisting of a half pint of molasses with an equal amount of hot water.

Cane sugar is undesirable, however, because of its irritating effects. The sugars of fruits—levulose and dextrose—are wholesome and efficient. The malt sugar produced by the action of the saliva upon starch is of great service as a stimulant of gastric and intestinal activity. Many mothers know of the laxative effect of malt sugar added to the infant's food.

Lactose, or milk sugar, is to some persons decidedly laxative, even in doses of two or three dessertspoonfuls taken daily before breakfast. Lacto-dextrin is a highly valuable laxative through its efficiency in changing the intestinal flora. It causes the *B. acidophilus* to become dominant and the acids formed stimulate peristalsis.

Fruit and Vegetable Acids

The acids of fruits and vegetables—citric, malic, and tartaric,—are excellent laxatives. This is, in part at least, the explanation of the good effects of an orange taken at night or

before breakfast. All acid fruits are laxative. The tomato, a vegetable fruit, is a most excellent stimulant of intestinal action. When possible, the tomato as well as other acid fruits should be eaten raw, to obtain the best effects.

Lactic and acetic acids developed in the intestines by the growth of harmless acid-forming bacteria, are powerful stimulants of intestinal action. A. Schmidt of Halle, Germany, has demonstrated that these acids are the normal stimulants of the colon. When they are present in sufficient amount, bowel activity is normal. Putrefaction produces an alkaline condition in the colon which has a paralyzing effect upon the intestinal movements. Sour milk and buttermilk produce a decided laxative effect in many persons, especially in children. By changing the intestinal flora, the contents of the colon become acid, and thus bowel action is improved. This alone is often sufficient to cause regular bowel movements in very obstinate cases of constipation.

The addition to a hot (105° F.) enema of citric or lactic acid (one or two drams) or the juice of one or two lemons (two or three

ounces of lemon juice) is a most effective means of stimulating a sluggish colon to activity. Acids thus applied directly to the colon are much more efficient than when taken by mouth.

Fats

Oils and fats stimulate intestinal action. Not only fats themselves, but the glycerine and soaps which are formed by the digestion or decomposition of fats in the intestine, are very active stimulants of intestinal movements,

Mineral oil, being unabsorbable, is a very powerful stimulant of intestinal activity. It adds to the bulk of the food, lubricates the food canal, hinders the excessive absorption of water, and keeps the bowel contents moist.

Gases

The carbonic acid gas and other gases formed in the intestine by the fermentation of starch, cellulose, and other foodstuffs are powerful stimulants to the muscular activity of the bowel. When present in excess, gases cause spasm of the circular muscles of the intestine, with sharp colic pains.

Eating

The taking of food into the stomach is by far the most powerful of all the natural stimulants of the intestine. Very soon after food enters the mouth, peristaltic movements begin in the stomach, and quickly extend the whole length of the food canal. This is the reason for the desire to evacuate the bowels which most people experience soon after eating breakfast. The peristaltic waves set up carry the feces down into the rectum, and this produces the sensation which indicates the necessity for evacuation.

It has been shown that even the smell of agreeable food is sufficient to cause increased intestinal activity. The act of swallowing also excites intestinal activity.

Hurst, of London, holds that there is very little movement of the food residues along the intestinal tract except during the taking of food. According to Hurst, X-ray examinations show that the taking of food into the stomach sets up vigorous peristaltic waves which move the contents of the small intestine forward into the colon and propel the food

residues already in the colon further on toward the exit. The natural result of this physiological arrangement is to bring about a bowel movement after each meal.

Psychic Influences

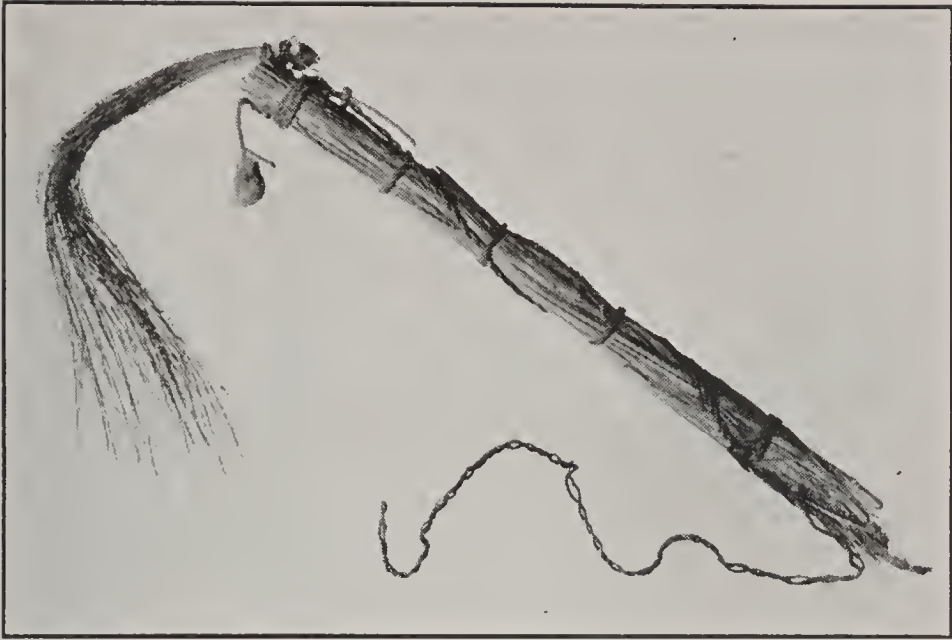
Pleasurable emotions and excitement have been known to produce intense activity of the intestines, and even diarrhœa, while depressing emotions have the opposite effect. This has been clearly demonstrated experimentally, in animals as well as clinically in human beings. The effect of fear and worry is to cause a contracted or spastic condition of the descending colon, an effectual bar to bowel movement. A patient's anxiety lest his bowels shall not move may throw his colon into a state of stage fright, so to speak, and render it incapable of normal action.

The automatic functions of the body are interfered with when the mind is concentrated upon them. This is the cause of stuttering. The stammerer's impediment of speech disappears as soon as he forgets about it.

The Congo native touches a fetish prepared for him by a witch doctor, when he is consti-

pated, and his bowels forthwith move. The accompanying cut shows a fetish employed for this purpose, which was presented to us by a medical friend, Dr. Stauffacher, for many years a medical missionary in the Congo region. The fetish is hung on a tree close to the path that leads to the retiring place in the nearby jungle. As the native passes he touches the fetish and straightway his bowels move. When the writer remarked, "Of course, the constipated patient soon finds that the fetish is useless," the doctor replied, "But it works, it really works remarkably well, and is in very general use." It is possible that the "liver pads" of a generation ago may have "worked" on the same psychologic plan.

Cannon, studying the intestinal movements in the cat, by the aid of the X-ray observed that all movement instantly stopped when the cat's tail was pinched, causing her to "spit" in resentment. The intestinal activity was only resumed when the effect of the irritation had passed away, as shown by the contented purring of the animal.



A Congo Fetish—Famous as a Cure for Constipation



Applying the Dumbbell Vibrator



The Vibrating Chair

Electricity

This powerful agent may be applied in such a way as to greatly stimulate intestinal activity. The most effective method is the application of the sinusoidal current to the rectum and abdominal muscles, or to the rectum and the central portion of the back. Another very effective method, perhaps the most efficient of all methods, is the application of a bi-polar electrode to the inner surface of the pelvic colon, which is the point of greatest delay in the majority of constipated persons.

Mechanical Vibration

Powerful mechanical impulses may be communicated to the intestines and the nerve ganglia which control them, by suitable apparatus. The writer has in numerous instances seen strong intestinal movements set up by this form of stimulation. The writer was recently informed that it is the practice of the trainers of performing horses to cause the animals to empty their colons just before they are led out to perform by vibratory stroking over the lower colon.

The accompanying cut shows a dumbbell

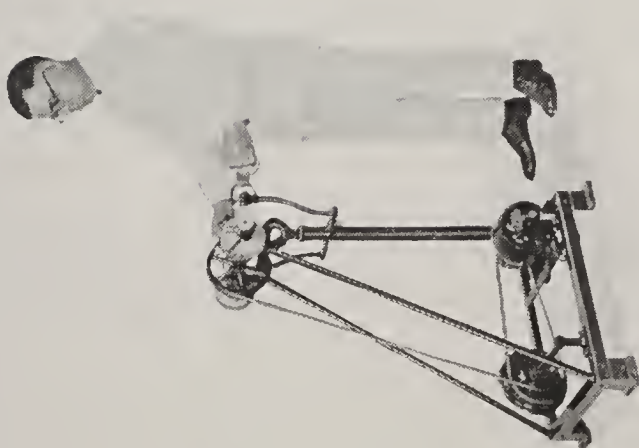
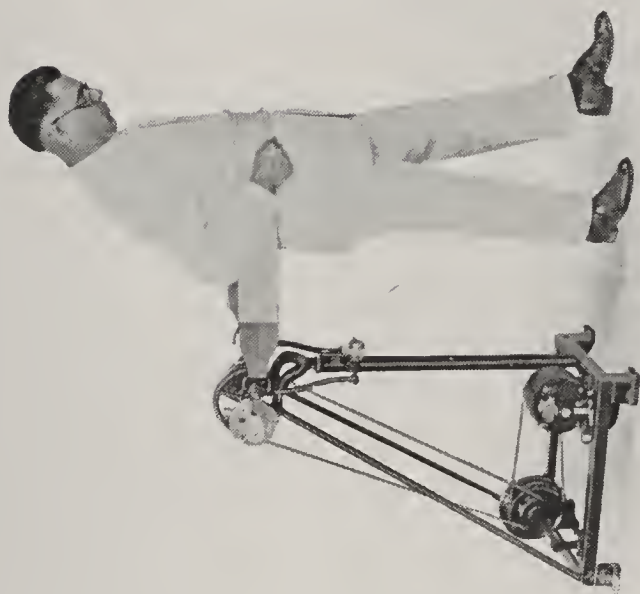
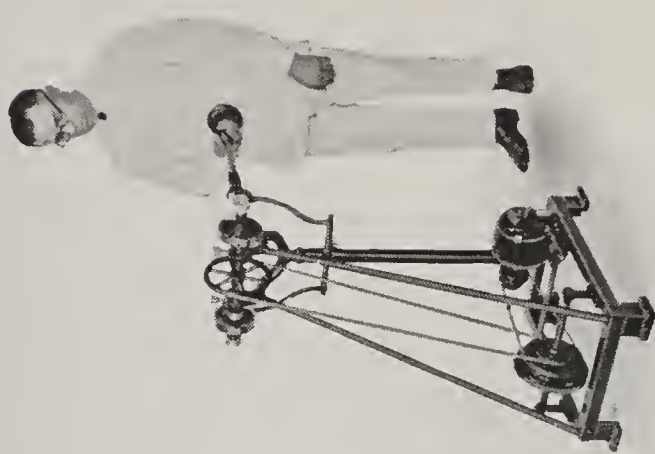
vibrator which is effective when applied along the course of the colon, especially over the pelvic colon which lies low in the left side. Still more powerful effects may be induced by application of the dumbbell vibrator to the sacrum and the anal region.

The vibrating chair, the vibrating stool, and the vibratory table are all powerful means of stimulating the colon. The oscillo-manipulator is another efficient means by which mechanical stimulation may be applied to the colon. These several appliances, devised by the writer for use in the Battle Creek Sanitarium, are shown in the accompanying cuts.*

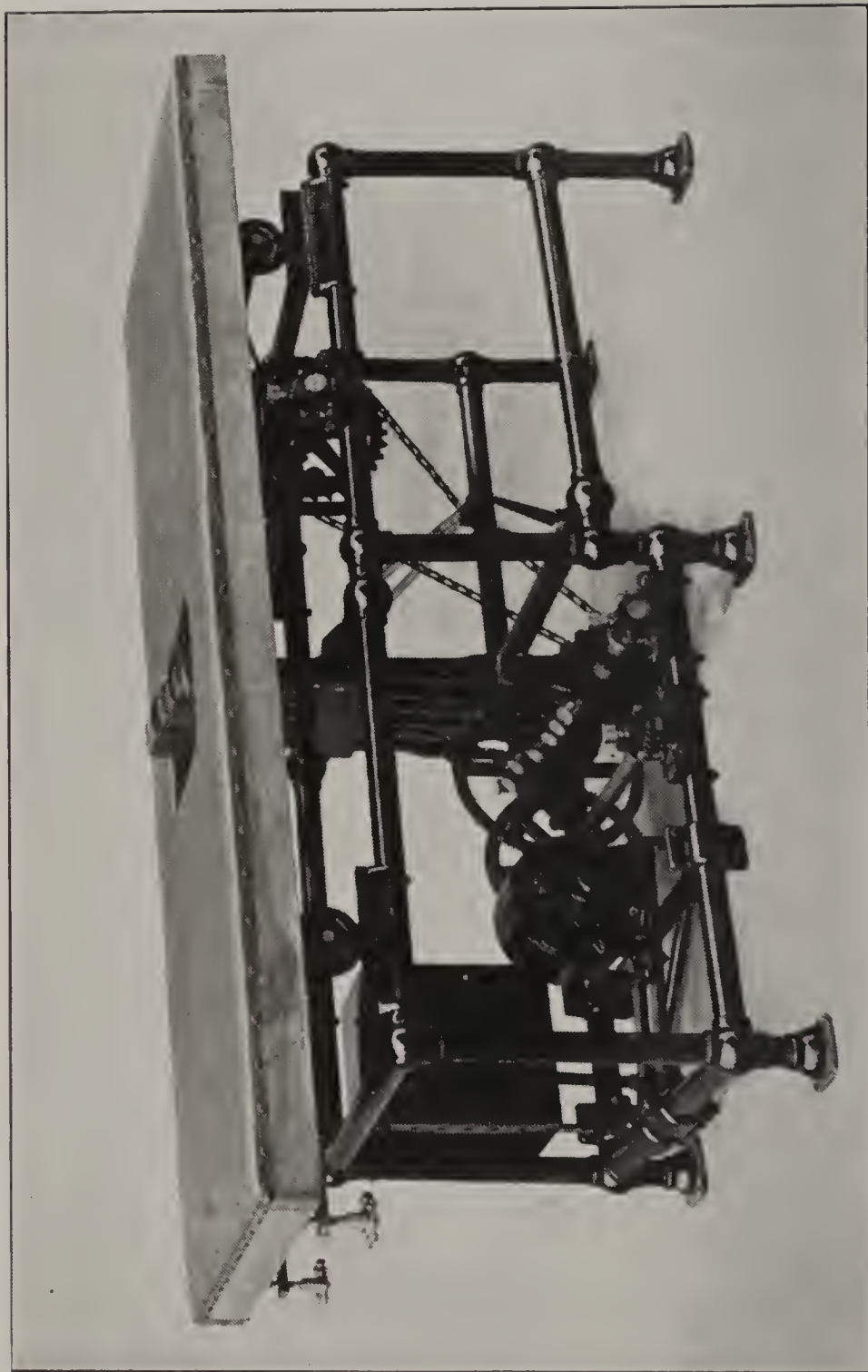
Massage

This is another valuable mechanical means of stimulating the bowel to increased activity. Kneading with the hands or with a suitable mechanical appliance has been shown to be capable of quickening the movements of the intestine, if applied with sufficient thoroughness. The writer has elsewhere described the

* Manufactured by the Sanitarium Equipment Company, Battle Creek, Mich.



Mechanical Massage of the Colon with the Oscillo-Manipulator



Bowel Kneading Apparatus

technic of abdominal massage.* It may be noted here that manual massage to be most effective must be given in such a way as to definitely reach and sharply compress the colon so as to stimulate it to action. The colon can best be reached at the sides of the abdomen near the groins.

Stroking, or reflex titillation of the skin, stimulates the bowel in much the same way that tickling the soles of the feet may give rise to powerful contractions of the muscles of the legs. To be effective, massage intended to influence the intestinal movement must be given by an expert.

Mechanical kneading of the abdomen is in many cases remarkably effective in relieving constipation. Not infrequently a bowel movement occurs immediately after a ten-minutes' application. The accompanying cut shows an abdominal kneading machine devised by the writer and in use for many years in the Mechanotherapy Department of the Battle Creek Sanitarium.

* "The Art of Massage." Modern Medicine Publishing Company, Battle Creek, Mich.

Abdominal Compression

This method acts upon the intestine by increasing the intra-abdominal pressure. It is most effective when applied in cases in which the abdominal muscles are weak and relaxed.

The compression may be made continuous by the application of a tight abdominal bandage; or intermittent pressure may be applied, if desired, by means of an inflated rubber bag. These measures will be explained more fully elsewhere.

Exercise

Bodily activity is another way of mechanically stimulating the intestine. Vigorous exercise sets the diaphragm and abdominal muscles at work in such a way that the intestines are, between the two, vigorously kneaded and squeezed and thus stimulated to action.

Every farmer knows the constipating effect of idleness upon his horses and cattle. Most observing persons have noted in their own experience the advantage of taking a brisk walk before or after breakfast.

The sedentary man or woman not only

loses the immediate benefit which results from the increased activity of the diaphragm and abdominal muscles, but his abdominal muscles become permanently weakened, relaxed, lacking in tone, and incapable of supporting the intestines in their proper place, thus adding a number of other factors which contribute very materially to the lessening of intestinal activity.

Posture

A stooped or relaxed posture in sitting or standing tends strongly to induce constipation by weakening the abdominal muscles and causing congestion of the liver and all other abdominal organs. The viscera, over-filled with blood, and lacking the support of the abdominal muscles, become prolapsed. The colon falls with the rest; the intestinal contents stagnate; the bowel becomes distended; the ileocecal valve becomes incompetent, infection travels up the small intestine, and a long list of ills result.

An erect posture secures proper exercise of the muscles of the trunk, correct breathing, normal circulation of blood in the viscera, and

promotes in a high degree normal bowel movement.

A further cause of injury is the lowering of the diaphragm and diminished action of this important muscle, which when normally active applies to the colon and other viscera a sort of rhythmic massage which is a valuable aid to bowel action.

Hot and Cold Applications

Cold applications, and even extremely hot applications, act as powerful stimulants to the intestinal muscles. To be effective, the applications must be short and intense. The cold spinal and abdominal douche, and the cold douche to the feet and legs, are the most effective external procedures. The cold enema (75° F. to 40° F.) produces almost immediate bowel movement. The cool enema should not be used in cases of spastic colitis.

Hot Applications

Hot applications, externally and internally, often aid bowel action by relaxing a spastic or contracted colon. The colon may be contracted as the result of irritation through re-

flex action from diseased ovaries or some other diseased vital organ, or even as the result of some depressing emotion such as fear, worry or anger. In such conditions, bowel action is best encouraged by applications of heat, either external or internal, which relax the contracted bowel. External applications of heat may be made by means of the fomentation, the moist abdominal bandage, the hot sitz bath, or by means of the photophore or other means of applying heat.

The hot enema (102° to 105° F.) is a most efficient means of relieving bowel spasm. It should be used in all cases of spastic constipation and colitis to insure complete emptying.

The Hot Enema with Acid

The addition to the hot enema of the juice of a lemon or one or two drams of citric or lactic acid or two tablespoonfuls of lactose-dextrin, will greatly increase its efficiency. The heat of the enema relaxes the contracted bowel while the acid present stimulates the bowel to normal contraction without producing a state of spasm. This method often succeeds when other means fail.

INFLUENCES WHICH LESSEN IN- TESTINAL MOVEMENTS

There are certain foods and other agents and influences that exercise a decided slowing influence upon intestinal movements, either directly, or indirectly through the suppression of the normal stimuli.

Liquid Foods

Such foods as soups, gruels, porridges, and purees contain so little solid matter that the bulk, considerable though it may be when the food is eaten, is soon reduced to a very small volume. On this account liquid foods are almost always constipating. The only exceptions are those liquid foods which contain much sugar, acids, or fats.

Pasty cereals such as oatmeal mush, are decidedly constipating in their influence, because of their pasty consistency and the little mastication which they receive. New bread, hot biscuits, "noodles," and doughy foods of all sorts are likewise objectionable.

Concentrated Foods

Foods which contain little or no waste or indigestible material are so completely digested and absorbed that the bulk left in the intestine is insufficient to stimulate segmentation or peristalsis. In feeding the sick, the mistake is not infrequently made of feeding exclusively fluid or concentrated foods, with the idea that such foods tax the digestive organs least. In a sense this is true, but the importance of maintaining proper bowel action is so great that this must be considered in the dietary, and with rare exceptions the patient will perfectly well tolerate simple salads, stewed fruit of some sort, whole wheat preparations, especially wheat flakes, in which the whole grain is represented, and even cooked bran.

The conventional "tea and toast" is about the worst diet that could be offered a sick person. The panadas, puddings, and "slops" of various sort are little better.

Fruit juices of all sorts are, on the other hand, most suitable for almost all forms of sickness. They contain choice nutriment in a

form needing no digestion, ready for immediate absorption and assimilation.

Orange juice or freshly expressed juice of apples, grapes, or other sweet or sub-acid fruit, is ideal nourishment for the sick. In the absence of these fruits, dried fruit, soaked long in water may furnish a very fair substitute. Canned fruit juices come next in value. To these rice, or some other cereal food, may be added in proper amount, with malt sugar in some form. Roughage in the form of lettuce, celery, purées of fresh vegetables such as turnips, carrots, tomatoes and especially spinach and other greens is especially useful and is seldom contraindicated.

Vitamins Needed

McCarrison has shown that vitamins, particularly the vitamin B, encourage intestinal activity. The so-called "constipating foods" are lacking in this highly essential food principle. Care must be taken to make free use of foods rich in this element, such as bran, greens, Savita (yeast extract), Zo, and all vitaminized foods.

Abstinence

In a state of absolute fasting the intestine is in a state of complete inactivity. The normal stimulus of food is lacking, and there is nothing to call forth the rhythmical activities which accompany normal digestion. This fact is too often overlooked in the care of surgical patients and in the treatment of obesity, gastric and duodenal ulcer, and other conditions in which the intake of food is suspended or reduced. In such cases it is highly important that the colon should be washed out thoroughly by an enema at least twice daily. It must not be forgotten that the colon is not merely a receptacle for unusable food remnants, but is also an excretory organ, and the avenue through which the highly poisonous bile is discharged. It has been shown that the bile is six times as poisonous as the urine. The secretion of bile is continuous and its prompt discharge from the body is as important as the discharge of the far less poisonous urine.

Pain

Pain in almost any part of the body may arrest intestinal action by causing a reflex interference. Pain or inflammation in any part of the abdomen, especially such painful affections as rectal ulcer or fistula, inflamed hemorrhoids, chronic appendicitis, inflammation of the bladder, prostate, uterus, ovaries, and other pelvic organs, all give rise to inaction of the intestine, not only by inhibiting or preventing peristalsis, but also by causing obstruction through contraction of the ileocecal sphincter. The pain and irritation of an ulcer or fistula, or inflamed hemorrhoids, may induce constipation by causing spasms of the anal muscle, and so preventing the normal relaxation in the act of defecation.

Miscellaneous Causes

Depressing emotions, such as anger, fear, or despondency, all suppress the normal movements of the intestine, and thus form a vicious circle which continually aggravates both the malady and its cause.

The effect of these depressing emotions is

to raise nerve tension. The so-called "muscle tonus" is increased. The descending and pelvic colon may become spastic, that is, strongly contracted. This condition of the colon renders impossible normal bowel action and may even give rise to an exaggerated reverse peristalsis, by which the contents of the colon are carried backward through an incompetent ileocecal valve into the small intestine, a condition often encountered in persons suffering from so-called neurasthenia, or "nervous prostration."

Heat lowers muscular tone, and hence checks the intestinal movements. This is well seen in the relief obtained by the application of a fomentation to the abdomen, or the administration of a hot bath or a hot enema in a case of intestinal colic or diarrhœa.

Hot drinks, as well as hot baths, tend to slow intestinal movements by relaxing the bowels or lowering "tonus," and the habitual use of hot (105° F.) enemas often aggravates the condition for which the treatment is given.

This tendency of the hot enema may be avoided by taking care never to use a larger quantity than two quarts of water and to fol-

low the hot enema by a small enema of water at a lower temperature (80°). With these precautions, the enema may be used for an indefinite time without injury.

Sweating, if very profuse, encourages intestinal inactivity by removing large quantities of water through the skin, and thus producing excessive dryness of the intestinal contents.

Elevated body temperature, whether caused by fever or by a hot bath of some sort, tends to slow the intestinal movements.

Sleep and inactivity slow the intestinal movements by lessening the activity of the diaphragm and the abdominal muscles. The first voluntary movements made on awakening in the morning often start up peristalsis, and often provoke a desire for evacuation of the bowels. Persons who lead inactive lives almost always suffer from constipation, though often unaware that this is the case, for reasons which we shall present later.

Loss of sleep. Loss of sleep often interrupts bowel movements by causing a spastic or contracted condition of the descending colon and pelvic colon. This is the result of

the increased "tension" caused by loss of sleep.

Prolonged cold sitz baths cause intestinal inactivity by inducing a spasm of certain of the food gates, probably the ileocecal sphincter. This result occurs if the bath is continued for more than seven or eight minutes. When for any reason the use of the prolonged sitz bath becomes necessary, special precautions in diet and otherwise must be taken to prevent producing this undesirable effect.

A diet largely made up of meat necessarily favors intestinal inactivity, first because the complete digestion of the meat leaves too little residue to stimulate peristalsis, and second, because an excess of protein encourages putrefactive processes in the intestine, which establish an alkaline condition of the intestinal contents. The stools of flesh eaters usually have a very strong ammoniacal odor, and when tested by the chemist are found to be strongly alkaline. Alkalies paralyze the colon, while acids stimulate it.

CAUSES OF CONSTIPATION

The causes of a disease so universal in civilized communities must be very numerous to produce this condition in so great a number of people living under many different conditions, and with different habits of life. In general it may be said that the causes of constipation are abnormal habits or conditions of life, the result of what we call civilization. Savages rarely suffer from constipation, which is also true of the more primitive of so-called civilized nations. Chronic intestinal inactivity is much less frequent among country people than among those living in the city. It is manifestly a morbid condition peculiar to a state of high civilization; and modern medical researches tend to show that this condition and its results may justly be looked upon as among the fundamental causes of the race degeneracy which is becoming every year more apparent in all highly civilized communities.

We may therefore expect to find adults suffering from constipation much more than

children, although this malady often begins early in life. Women are more subject than men to intestinal inactivity and all the terrible consequences which result from this condition. Westphalen asserts that four-fifths of all women suffer from constipation from their youth onward, a statement that is corroborated by Foges, the eminent specialist of Vienna, and that few experienced practitioners will deny. Adults have been longer exposed to the degenerative influences of civilized life than have children, and the life of civilized women is to a considerable degree more highly artificial and unnatural than that of men.

Professor Virchow more than half a century ago called attention to the fact that post-mortem examinations show evidences of disease of the intestines in almost every case of many hundreds examined, irrespective of the cause of death. Indeed, he declared it to be almost impossible to find an adult person whose intestines did not show adhesions and other evidences of chronic disease. At that time the origin and significance of these inflammatory conditions was not understood. We now know that infections of the interior

of the intestine, by causing inflammation of the intestinal walls, readily extend to the outside, giving rise to inflammatory changes and adhesions. In these adhesions, located in various parts of the intestine, but particularly at special points noted by Professor Virchow, and more recently by Dr. Arbuthnot Lane, we have both a consequence and a cause of constipation.

The Rationale of Constipation

To fully comprehend the influence of various habits and conditions in developing constipation, it is necessary to have in mind the mechanism of defecation and the conditions essential to the normal colon action. The several acts by which the colon is emptied of its contents may be briefly summarized as follows:

1. Contraction of the diaphragm—a deep breath.
2. Contraction of the abdominal muscles.
3. Pressure of the thighs against the abdomen as in the squatting position assumed by the savage.

4. Reflex contraction of the abdominal muscles.

5. Contraction of the colon.

6. Relaxation of the anus.

7. Contraction of the levator-ani muscles.

Any influence which interferes with a single one of these seven steps in the normal process of defecation may give rise to constipation, and when the disturbing influence is of such character as to interfere with several factors, the result is certain to be an extremely obstinate form of colon inactivity.

The causes of constipation may become operative either before or during the action of defecation. In order that normal defecation should occur, it is necessary that fecal matters should reach the pelvic colon in condition to be expelled from the body, and that the pelvic colon should be free to rise out of the pelvis, so that it may discharge a part of its contents into the rectum; and it is then essential that there should be no interference with any of the several factors which enter into the normal act of defecation.

Among the causes that may operate to prevent the proper preparation of the bowel for

the act of defecation through the accumulation of the bowel contents in the pelvic colon, are the following:

1. Deficient bulk of intestinal contents. If the amount of the intestinal contents is too small to distend the pelvic colon, the bowel will not be stimulated to action. This condition naturally results during fasting, and may also result from the use of a concentrated diet.

2. A spastic or contracted condition of the bowel in the transverse, descending, or iliac colon may hold back the intestinal contents, preventing them from reaching the pelvic colon, and so may interfere with normal bowel action.

3. Adhesions, by interfering with the normal contraction movements of the colon, may seriously cripple its function.

The most common and crippling adhesions are those connected with the pelvic colon and the cecum. The pelvic colon when empty collapses and sinks to the lowest part of the abdominal cavity. The prolapsed bowel may become adherent wherever it happens to fall and then may fail to rise. A pelvic colon thus

crippled no longer acts in an efficient manner to discharge the food residues and as a result the fecal matters accumulate in the descending colon until the pressure becomes so great that they are forced through to the rectum. This is one of the most obstinate forms of constipation. A practical cure may usually be accomplished by changing the intestinal flora and regulating the diet and the daily enema; but in some instances surgery is necessary to release the adhesions of the pelvic colon and to fix it in its normal position.

The colon may also be seriously crippled by adhesions of the cecum. Such adhesions may be the result of colitis or may be due to appendicitis. They are very likely to be present in cases in which operations have been performed for the relief of appendicitis. Adhesions of the cecum prevent its normal action which is to lift up and push into the transverse colon the food residues which enter the colon from the small intestine. When the cecum can no longer perform this function, it becomes a sort of cesspool in which fecal matters accumulate and often reach an advanced stage of putrefaction. The adher-

ent cecum often becomes dilated to an enormous extent, filling the pelvis and compressing the rectum.

4. Ordinarily, the whole bowel is not emptied in the act of defecation. The length of the colon is such that the residue from two or more meals may be present in different parts of the intestine at the same time. For example, the supper residue may be passing into the cecum while the dinner residue occupies the transverse colon and the breakfast residue is in the pelvic colon ready to be dismissed.

The descending colon is normally found in an empty state. When the intestinal contents are pushed from the transverse colon over into the descending colon, they are not long retained, as in other parts of the colon, but pass rapidly down to the pelvic colon, which seems to be intended by Nature for a sort of discharging reservoir, in which the fecal matter accumulates until a sufficient degree of distention of the bowel has been induced to stimulate peristaltic action.

A lack of this distending stimulus, which is essential to bowel activity, is a cause of con-

stipation in a large number of persons whose pelvic colons have been over-distended. In such persons an extremely bulky diet is necessary to fill the pelvic colon to such a degree as to bring about the reflex movements which induce normal bowel action.

5. In persons who are chronically constipated the descending colon is often constantly filled. The long contact of the poisonous fecal matters with the mucous membrane gives rise to infection. This is colitis. Colitis causes contraction of the bowel, thus becoming a new and most potent cause of constipation. The contraction caused by colitis not only obstructs the bowel, but also sets up anti-peristaltic movements, thus reversing the action of the bowel and carrying material back to the ascending colon and cecum. Normally, the anti-peristaltic contractions start at the middle of the transverse colon and do not involve the lower half of the colon. But when colitis and spasm are present, the reverse movement extends even to the pelvic colon. This fact, discovered by Case, explains the peculiarly irregular and erratic bowel movements characteristic of colitis.

6. By compression of the waist, such as results from the wearing of corsets and tight dresses, the action of the diaphragm is greatly crippled. This may be one reason why women in general suffer from constipation more than do men. The feeble condition of the diaphragm and other breathing muscles, which is the natural result of neglect of exercise, produces a similar effect in both men and women.

7. A feeble and relaxed condition of the abdominal muscles, the result of a sedentary life, and especially of a stooped and relaxed posture of the body in sitting or standing, will necessarily interfere with both voluntary and reflex contraction of these important muscles, which is an essential factor of normal defecation. When the colon has been long over-distended by neglect, and relaxed by the long-continued use of the warm enema, its power to contract is necessarily greatly diminished. This condition of the bowel not only prevents efficient normal defecation, but the efficiency of the bowel may be still further interfered with by adhesions and kinks.

8. Hemorrhoids, fissures, ulcers, fistulæ,

and simple irritation of the mucous membrane in the anal region, may cause spasm or abnormal tightness of the anal muscle, so that the ordinary reflex is insufficient to cause relaxation of the muscle, and it thus becomes a mechanical obstacle to bowel movement.

9. The levator-ani muscle frequently becomes so weakened by continuous over-stretching, as the result of accumulation of hard fecal matters in the rectum, that it loses its power to contract. This condition may also be induced by proctitis, a common result of constipation.

When the rectum walls are thus weakened and paralyzed, the rectum, instead of being always empty except during defecation, always contains more or less fecal matter, the constant contact of which with the mucous membrane produces loss of sensibility and chronic catarrh or proctitis, and often gives rise to hemorrhoids, anal ulcer, abscesses, fistula and local affections.

It is thus apparent that in all cases of constipation there is a definite reason for intestinal inactivity. In every case of really serious constipation—that is, cases which are not re-

lieved by regulation of diet—careful inquiry must be made for the purpose of ascertaining the exact conditions which are interfering with normal intestinal movement, including both the exciting and the predisposing causes of these conditions, which will be considered at length in succeeding pages.

Most cases of constipation, even of the most obstinate character, may be greatly if not wholly relieved by regulating the diet, especially by changing the intestinal flora. Even when there may exist a considerable degree of mechanical disturbance because of adhesions, incompetency of the ileocecal valve, dilatation of the cecum, etc., great betterment of the patient's condition may be secured, especially by changing the intestinal flora; for it is the contents of the colon, not the colon itself, which is the real cause of disturbance. Certainly, no operation is called for until other measures have been faithfully tried.

SIX DANGEROUS ERRORS ABOUT THE COLON

It is probable that more disease, premature old age and death, misery and even crime, originate from constipation than from any other bodily disorder. Constipation is not in itself a disease, but is a symptom the cause of which may be disease or simply neglect.

There are several very prevalent errors respecting the colon and its functions which are probably responsible for most of the mischief which arises from disorders of this part of the body.

One of the most universal and mischievous of errors about the humble colon is that its function is one which modesty imperatively demands shall be concealed even at the expense of great suffering. It is indeed only in very recent times that public transportation companies, railroad and trolly lines, have begun to make anything like decent or adequate provision for the colon needs of their patrons. And even at the present time there are hun-

dreds of small stations and waiting rooms wholly unsupplied with toilet conveniences.

Very few of our cities and towns offer any sort of public toilet provisions for either men or women.

Thousands of factories and other places where men or women are employed provide no adequate toilet arrangements.

It is a most dangerous error to suppose that the colon function can be neglected or postponed with impunity. Many people, perhaps the majority, regard the moving of the bowels as a disagreeable duty which may be postponed to suit the demands of business or convenience.

The results are most disastrous. The majority of chronic human ills are the result of this neglect.

Another common error which is held by most medical men as well as by the laity is that the stool should be "formed." This is a false notion which has grown out of the universal constipation habit which prevails among civilized folk.

The vegetarian Hindus, of Armistar, who live chiefly on ground wheat and vegetables,

according to Dr. A. H. Browne, have "large, bulky, and not formed, but pultaceous" stools.

A well-formed stool always means constipation. The significance is that the colon is packed full like a sausage and that the fecal matters have been so long retained that they have been compacted by the absorption of water. The whole colon is filled, and the bowel movement is the result of the pressure of the incoming food residues at the other end. When the body wastes are promptly discharged as they should be, the colon never contains the residues of more than two meals and at the after-breakfast movement should be completely emptied so that the disinfecting and lubricating mucus which its walls secrete may have the opportunity to cleanse and disinfect the body's garbage receptacle and thus keep it in a sanitary condition.

The California doctor who advised his patient to restrain his desire for bowel movement at night and "save it till the next morning" so that "he might have a well-formed stool," had not the first conception of the normal function of the colon.

That one bowel movement a day is nor-

mal and efficient evacuation of the bowels is another error which is universally entertained. One bowel movement a day is a positive indication of constipation. X-ray examinations of the colon after a test meal show that in persons whose bowels move once a day the body wastes are usually retained for fifty hours or more. Hurst, of London, and not a few other authorities finding this condition almost universal have been led to regard it as normal. But in this they are certainly in error. X-ray examinations show that in eight hours from the beginning of a meal the process of digestion has been completed, the digested food has been absorbed, and the unusable residue has been pushed half way through the colon, in other words, is within two and a half feet of the lower opening of the colon. In eight hours the food has travelled more than twenty-five feet or ten times the distance which remains to be travelled. The work of digestion is finished, the useful part of the food has been absorbed, there remains nothing to be done but to dispose of the indigestible and useless residue by pushing it along two or three feet further.

Certainly no good reason can be assigned for the further retention of the waste matters. It is indeed highly absurd to suppose that forty hours are needed to transport the feces two and a half feet when they have already travelled twenty-five feet in eight hours.

The bowels should move at least three times a day or after each meal. Four movements daily is a still better rhythm and is easily established by a biologic regimen. This the writer has proven not in a few exceptional cases but in thousands of patients who have been willing to take the trouble to train their bowels by means of a proper diet and other simple and natural means.

A fourth error which leads to wrong conclusions and paralyzes efforts toward change of conditions is the supposition that the stools or fecal matters are necessarily putrescent and loathsome. This is by no means true. The writer has had under his care at different times a number of patients who had temporary openings close to the lower end of the small intestine where it joins the colon. Examination of the intestinal contents when they had an opportunity to escape at this point showed

that they are often wholly free from offensive odors and other evidences of decomposition. This fact as well as many others shows that the changes which take place in the colon are the cause of the offensive character of the stools. This is the natural and necessary result of the long delay of putrescible material in the warm, moist colon, always swarming with germs and the most favorable place possible to imagine for the promotion of putrefactive processes. Let the reader try to imagine what would happen to a beefsteak carried in an inside pocket next the warm skin for two or three days. It would certainly become far advanced in decay. And that is just what happens to every particle of undigested meat and other proteins. The change known as putrefaction is slow in beginning; it makes little advancement the first twenty-four hours, but after that the intensity of the process increases very rapidly.

The carmine capsule test shows that in most cases in which the bowels move once daily, the waste disposal function is always several days in arrears. The colon contains the waste and residues of several meals,—any-

where from five to twenty or even more, so that there is ample opportunity for the putrefactive process to get well under way.

This putrefaction is the source of the foul odor and gases which originate in the colon, and which are not only most offensive to the sense of smell, but as is well known, are also highly poisonous, and may give rise to nausea, "biliousness," loss of appetite, foul tongue, bad breath, dingy skin, headache, Bright's disease, and a host of other grave disorders.

The stools of a person who lives biologically, that is, whose diet is restricted to food-stuffs which do not readily undergo putrefaction, such as fruits, grains, nuts, roots, green vegetables and milk, are often almost odorless. The sickening, ammoniacal odor usually present is absent. The stools, if not odorless, may have an acid odor, like the bowel discharges of a young breast-fed infant. The difference is the same as that between the stools of a dog and those of a sheep, and for the same reason. In the case of the dog and the meat-eater there are always to be found in the colon fragments of decaying flesh; while in the colon of the sheep, the nursing

infant or the flesh-abstainer, the food residues present consist chiefly of substances which ferment, producing acids, but do not undergo putrefaction.

Some years ago a leading English physician recommended constipation as a measure of food economy. It was the contention of this physician that if the bowels were moved only once in two or three days the absorption of food would be more complete and hence less food would be needed. Some years later, Horace Fletcher gave wide publicity to this idea in connection with his chewing campaign. Mr. Fletcher insisted that the food must be chewed until liquefied before swallowing, and that all fibrous or insoluble material should be rejected and returned to the plate. Very pronounced constipation was the natural result of this practice. Small and infrequent stools were recognized as one of the expected results of Fletcherism. Mr. Fletcher himself considered his personal practice of moving the bowels once or twice a week, a very hard and scanty stool, one of the proofs of the advantage of his theory. Hundreds who were convinced of the advantages of

thorough mastication of the food and made a trial of Fletcherism were compelled to give it up, as did Prof. William James, because of the bad effects of the constipation which resulted and was wrongly charged to mastication, although really due to the rejection of cellulose which is necessary to furnish bulk for the stimulation of the intestine.

While it is doubtless true that less food is usually consumed by persons who are constipated, this fact is not the result of increased food economy but of lack of appetite. The toxemia which lessens the appetite lessens also initiative, endurance and efficiency, and cannot be considered in any way an advantage.

Laxative Drugs and Mineral Waters Highly Injurious

Still another grave error which has come to be almost universal is the trust reposed in saline mineral waters and other laxatives as means of combating colonic stasis or constipation. X-ray examinations, made by Dr. Case and others in hundreds of cases, have proven that laxatives of all sorts do great harm by causing spasm or spasticity of the lower part

of the colon and by increasing antiperistalsis, by which the fecal wastes are held back in the cecum and first half of the colon which thereby becomes distended, overstretched and permanently damaged. One of the consequences of this overstretching of the colon is the crippling of the ileocecal valve which is rendered incompetent so that the putrid fecal matters accumulated in the colon are forced back into the small intestine and are thus mingled with the digesting foodstuffs and absorbed into the blood along with them. This is essentially the same thing as discharging a sewer pipe onto the dinner table and mingling sewage with the food.

All laxative waters and medicinal laxatives of every sort are harmful. They afford temporary relief at the expense of increasing the difficulty by irritating the colon, causing colitis and obstinate contraction of the descending and pelvic colon, a condition practically equivalent to stricture of the bowel. The habitual use of laxatives is the most certain method of producing the most intractable forms of constipation.

PSYCHOLOGY OF THE COLON

The colon is richly supplied with sympathetic nerves and is highly sensitive to influence by all emotions pleasurable or the opposite. Cannon and various other observers have shown that unpleasant emotions of all sorts check peristalsis. Even very slight emotional excitement, as slight anxiety, annoyance, apprehension or ill-temper, may stop all movement of the intestine, as well as of the stomach, together with gastric secretion.

The colon, like the face, responds to every passing emotion. The intestine is perhaps more sensitive than are the muscles of the face to emotional excitement because more richly supplied with blood-vessels and sympathetic nerves. X-ray studies of animals have demonstrated the intimate association of the colon with the sympathetic nervous system and the profound effects of all forms of emotional excitement. In a dog placed in strange surroundings, peristalsis ceased for several hours. When a cat's tail was pinched, while under observation, peristalsis ceased. The move-

ments did not begin again until the cat was pacified as shown by a contented "purring."

The depressing influence of fear is well established. The frightened colon cannot discharge its contents because the descending colon is in a spastic state. So long as the patient is fearful that his bowels will not move, they will not. The colon is in a state of stage fright. It is crippled; but all that is needed for a cure may be to get rid of apprehension and fear. In such a case, the most effective remedies, any amount of bran and paraffin oil, will not move the bowels until the element of fear is removed. Confidence and faith will change the situation. Christian Science, Couéism, "faith healing," a fetish, a "liver pad," "magnetic" suppositories, anything that abolishes fear and establishes faith and optimistic expectation, will effect a cure.

The angry colon shuts up like a clam and declares "no thoroughfare here." Some persons are obstinately constipated because of a chronic state of ill will or anger. It is recorded that Cromwell's bowels had not moved for a week before he caused King Charles to be beheaded. And the theologian Calvin was

in a similar state when he signed the death warrant which sent Servetus to the stake.

Grief shuts up the outlet of the body's sewage system as tightly as does fear or anger. The worried colon neither secretes nor contracts. Both secretion and contraction are needed for efficient action,—secretion for lubrication and contraction for transportation of the food residues to the exit. In the "rice ordeal," long in use in India for the detection of the guilty one among a number of suspected persons, a portion of the sacred rice is placed in the mouth of each one. After a few minutes, the rice is removed from each mouth and placed upon the sacred fig leaf. The rice from the guilty is dry! A physiological proof of his criminality. An X-ray examination would show his colon as well as his salivary glands to be inactive.

The colon is imitative. When one dog empties his bladder or his colon, other dogs in sight are seized by the same impulse. Pouring water is a common device for inducing action of the bladder. The colon is also influenced. A German mother moved her own bowels by giving castor oil to her little

girl (Oppenheim). A visit to the toilet by association of ideas tends strongly to provoke bowel action. The writer is acquainted with a gentleman whose bowels habitually move at night when he removes his clothing in preparation for bed. If he happens to undress in the daytime, a desire to move the bowels appears as soon as the clothing is removed.

The hysterical colon may become a cause of distressing embarrassment. The late Dr. Goodell told of the case of a lady whose colon began producing a series of remarkable explosions whenever she became excited. On this account, she was barred from attending the theater or any public assembly.

Loss of sleep, business worries, domestic trials, harassment from any cause, may render the colon inoperable.

In view of these facts, which might be multiplied at great length, it is evident that a right mental attitude is essential for the successful treatment of a sluggish colon as well as roughage, lubrication, etc. With the laxative diet and various food accessories, must be mingled the firm faith that the natural and biologic means employed will accom-

plish the desired object. Such a faith will lead to regular visits to the toilet at the times when the bowels should move; that is, after each meal, on rising in the morning and on going to bed at night. Do not wait for a "call," but invite a call by giving the colon a chance for evacuation and by all means avoid haste. A hurried visit to the toilet will not encourage normal colon activity. A slow colon must be given time, especially when by a change of diet and attention to colon hygiene it is just beginning to behave in something like a normal manner. By patient training, the sluggish bowel may after a time be trained to act with normal promptness and celerity.

HABITS WHICH CAUSE CONSTIPATION

In considering the habits of life common among civilized people which give rise to constipation, we shall not undertake to arrange the subject matter in the order of relative importance, but rather speak first of those which are most common.

Hasty Eating

Insufficient mastication is a fault peculiar to civilized men. The savage, as well as the monkey and all lower animals that are provided with teeth for grinding food, masticates his food with the greatest thoroughness. The accompanying cut made from the lower jaw of a skull in the writer's possession, shows the teeth of an ancient mound builder, a Malkelkos Indian. The well-worn appearance of the teeth affords sufficient evidence of the thoroughness with which they were used in grinding the nuts and cereal foods eaten by aborigines.



Lower Jaw of Mound Builder

A most interesting fact which has been brought to light by the X-ray studies of the intestine made by Hurst, of London, and others, clearly shows the great importance of thorough mastication and great deliberation in eating. The roentgenologists have demonstrated that the stomach and small intestine are in almost constant action. Peristaltic waves pass over the stomach several times a minute. Even when the stomach is empty, its activity continues and, in fact, may increase, finally becoming so violent as to produce, as shown by Cannon, of Harvard University, the sensation of hunger. The small intestine continues to act so long as any portion of food remains to be acted upon, only becoming quiet after all food residues and wastes have been pushed forward into the colon.

But the colon behaves more like a receiving chamber. It is, in fact, the garbage receptacle of the body; serving chiefly to receive and to pass out of the body the unusable residues of food substances and certain body wastes which are excreted through the intestine.

Careful X-ray examinations of the colon show it to be almost entirely inactive except

during and immediately after the taking of a meal. The chewing of food apparently stimulates the colon to action through what is known as the gastrocolic reflex and so after each meal there is a mass movement in the colon which Hurst describes as "a powerful peristaltic wave which moves rapidly along a considerable length of the bowel carrying all the contents before it." By this mass movement, the colon contents are carried down to the pelvic colon where they may remain until the next meal, when another mass movement is set up which carries the fecal matters from the pelvic colon into the rectum, thereby giving rise to the "call" which is Nature's demand for an opportunity for defecation.

Two important lessons may be drawn from these observations. First, it is evident that chewing of the food is an important means of setting up in the colon the movements necessary to push forward its contents toward the outlet. When food is swallowed in a hasty manner, the colon may not receive the amount of stimulation required for efficient action and as the result the intestinal contents are not near enough to the outlet of the colon to insure evacuation after the following meal.

An additional suggestion derived from these interesting observations is that the taking of some simple food between meals or at bedtime may serve a highly useful purpose in stimulating the colon to increased activity, thus promoting those "mass movements" which are necessary to bring the intestinal contents to the outlet and secure efficient and frequent evacuation. Fruit is the food best adapted to this purpose. One or two oranges or apples or some other juicy fruit either at bedtime or midway between meals, has been found by many persons a most excellent means of promoting normal bowel movement.

Some years ago, the writer inquired of the man in charge of the monkey-house at the London "Zoo" with reference to the frequency of bowel movements in these interesting animals. The information received was to the effect that the big apes moved their bowels four times a day and the small monkeys ten or twelve times a day. The reason of the more frequent bowel movements of the small monkeys was found to be that the large apes were fed regularly three times a day, while the small monkeys were fed continuously by visi-

tors, who were permitted to give them nuts, bread, fruit, etc., so that the monkeys were eating practically all of the time.

Rejection of Roughage

Excessive chewing of the food, to which the term "bradyphagia" has been applied, has been charged with being a cause of constipation. The charge is unjust. A person who follows the recommendation made by Fletcher, to swallow nothing which cannot be reduced to liquid in the mouth, is sure to suffer as a consequence of insufficient bulk but not from the thoroughness of mastication.

Food should be chewed sufficiently; that is, until the tongue no longer discovers coarse particles, but the excessively prolonged chewing advocated by Fletcher is unnecessary and was not practiced by him except for experimental or exhibition purposes.

Insufficient Bulk

The alimentary canal of man, while not so long in proportion to his size as that of the herbivorous animals, is much larger and longer than in animals which are intended to

feed upon a flesh diet. The human intestine is approximately ten times the length of the body, that is, of the trunk, which is approximately half the height. The colon is sacculated like the colon of herbivorous animals, and like that of the higher apes, indicating the adaptation of the intestines to bulky food.

Meat Eating

Carnivorous animals have a short alimentary canal and a smooth colon. The movement of foodstuffs along this short, smooth passage is rapid. This is necessary for the preservation of the life of the animal, as undigested remnants of meat long retained in the body necessarily undergo putrefactive changes with the production of ptomaines and poisons of a dangerous character. The digestion of meat leaves little residue, hence a person who lives chiefly on meat suffers from constipation, a condition which favors the putrefaction of undigested food remnants, and this, by creating an alkaline condition of the intestines, paralyzes the bowel and further increases the constipation.

Meat also causes constipation through the

fact that it encourages putrefaction of the colon both by introducing putrefactive organisms in great numbers and also by providing material which is best calculated to encourage the growth of putrefactive organisms in the colon. Through the putrefaction of undigested remnants of the meat eaten, ammonia and other alkaline substances are formed which paralyze the bowel.

The infection of the bowel which results from meat-eating also gives rise to colitis and causes a spastic or contracted condition of the descending colon, a condition found present in the most obstinate forms of constipation.

An Excessively Bland or Monotonous Diet

Pavlov has shown the importance of taste as an element in digestion. According to his experiments, the activity of the stomach begins almost immediately after food is taken into the mouth. The intensity of the gastric activity depends upon the degree of stimulation of the gustatory nerves. Cash has shown by experiments on dogs that even the smell of food produces peristaltic activity.

In order, then, that these two prime purposes of eating—namely, the nourishment of the body, and the evacuation of poisonous material—should be efficiently accomplished, it is necessary that the food should be so inviting and stimulating to the senses which participate in the enjoyment of food that the digestive activity will be prompt and vigorous. A meal taken without relish and eaten as a mere matter of routine and duty does not accomplish this. A person who eats without appetite is always constipated. Even if the bowels move regularly, the discharged materials should have been gotten rid of twenty-four or forty-eight hours before; there is a latent constipation, the evil results of which do not materially differ in the main from those of other forms of constipation, although likely to escape attention. The bill of fare should be so varied from day to day and from meal to meal, and the food should be of such a character, that each meal will be taken with keen relish. This is especially important for persons whose lives are sedentary, and who on this account are more likely to suffer from loss of appetite, and the constipation which is

both a cause and a consequence of this difficulty.

The Exclusive Use of Cooked Food

While it is true that the cooking of food in general increases digestibility, experience in the feeding of both infants and adults has clearly shown that a diet consisting exclusively of cooked food is detrimental both to digestion and to general health, and may lead to the most serious results.

Some raw foods should be taken every day, or preferably at every meal. Among foods of this kind to be specially recommended are green corn fresh from the garden (uncooked), celery, lettuce, cabbage, fresh fruits of all sorts, turnips of the best varieties, cucumbers, tomatoes, and radishes, if care be taken to remove the acrid rind. Young carrots, prepared raw, are also relished by some.

These raw foods must be thoroughly chewed, as otherwise they may cause too long delay in the stomach. The universal relish for fresh vegetables, and the intense craving for them, is an evidence of their value. These foodstuffs, while supplying very little actual

nutriment, nevertheless furnish the body with certain elements which modern research shows to be essential, while at the same time they supply necessary bulk and a sufficient amount of undigested carbohydrates to establish in the colon conditions essential for a normal activity.

The vitamins which are most abundant in raw vegetables, are wonderful vital stimulants and apparently aid digestion. When the vitamins are deficient, toxic conditions shown by putrid stools soon develop. McCarrison has shown that vitamins are needed to energize the intestinal muscles. This is especially true of vitamin B, which is found in wheat bran and the germ of wheat, but is deficient in fine flour and many breakfast foods.

Hot Foods and Drinks

Heat relaxes and paralyzes, while cold stimulates. The practice of eating food as hot as it can be swallowed, and especially of taking hot drinks at meals, is unquestionably a very active cause of constipation.

A Meager or Low Diet

Many persons suffer from constipation because they do not eat enough. They are in constant fear of overloading the stomach and bowels, and the consequence is that these organs lack sufficient work to stimulate them to proper activity.

People who "diet" often do themselves great injury by too great restriction of the bill of fare, both in quantity and variety of food. A food that the patient imagines to be constipating or otherwise harmful is generally found to have the expected result. Thus, item after item of the food is discarded, until the bill of fare is reduced to a few articles which are usually taken without relish and with more or less apprehension of injury. Such patients might far better pay no attention to diet whatever; they would run far less risk of injury by taking whatever the appetite craved.

In increasing the amount of the food intake, the increase should usually be in bulk rather than in food value. The added bulk should consist of such foodstuffs as lettuce,

celery, turnips, tomatoes, greens, fresh fruits, bran and other articles which give large bulk with little nourishment.

Constipating Diets

Nurses, and perhaps physicians also, sometimes unwittingly do their patients great harm by restricting the diet to bland or liquid foods, which are often taken without relish, and which, on this account, as well as by lack of bulk, tend in the highest degree to promote intestinal inactivity and obstinate constipation. A diet like this naturally necessitates the use of artificial means for moving the bowels. Many a patient owes the beginning of his constipation to such a course of dieting during temporary illness. Milk, which has been so much relied upon as a sick-room diet, is particularly objectionable in a considerable number of cases, and should be much less freely used. Buttermilk is preferable, because of the lactic acid it contains. Its value is greatly increased by the addition of malt sugar or milk sugar, and wheatmeal porridge, or a porridge of corn meal or oatmeal made with the addition of wheat bran. Fruit juices are ex-

tremely useful. There are very few cases in which such fresh things as lettuce and scraped apple and other raw fruits may not be taken with great advantage as well as vegetable purees. The danger of the use of solid food in these cases is largely imaginary, if care is taken to exclude meat, fried foods, and indigestible combinations. Thorough chewing of the food is of course essential.

The dietaries generally prescribed in certain forms of chronic disease, and considered to be essential, are often highly constipating. This is particularly true in the treatment for diabetes.

In the dietetic treatment of hyperacidity, and especially of ulcer of the stomach and the duodenum, the usual prescription is of such a character as to cause constipation, which in turn leads to intestinal toxemia and to a relapse later on.

Fasting

Fasting, which is sometimes prescribed as a remedial measure, necessarily leads to constipation, unless some preventive method is adopted. The use of the enema is not suffi-

cient. Washing out of the colon can do nothing more than remove materials which have been deposited in it from the small intestine; and, in fasting, the small intestine as well as the stomach is in a state of complete inactivity. Bile, mucus and other secretions, as well as poisonous excretions from the blood, are accumulating from day to day, but there is no peristaltic movement to carry them onward, because no food is taken into the stomach. From these facts it is evident that absolute fasting, except when made necessary by some intestinal trouble or other equally imperative exigency, is rarely likely to prove beneficial.

Condiments

Mustard, pepper, pepper sauce, cayenne, capsicum, horseradish, and the whole list of hot, irritating substances which are frequently added to food as seasoning, having no food value in themselves, are active causes of constipation.

The concentrated residues of the foodstuffs, including the indigestible particles of mustard, pepper, or other condiment taken with the food, brought in contact with the rectum

cause chronic catarrh; hemorrhoids develop together with ulcers, fissures, and abscesses, followed by fistulae, and the way is prepared for tuberculosis and cancer.

In India, especially in Ceylon, and also in Mexico, countries in which curries and hot, peppery sauces are used, gastric catarrh, constipation and hemorrhoids are almost universal among those addicted to the use of these pernicious food-poisons.

Irregular Meals

When the meals are not taken regularly, the rhythmic peristaltic impulse by which the feces are pushed forward from the colon into the rectum is lacking. If, for example, a person's habit is to move the bowels immediately after breakfast, and the breakfast is not taken, the bowels may not move, or if a movement occurs, it will be incomplete; instead of complete emptying of the colon below the splenic flexure, which occurs in a normal movement of the bowels, only the pelvic loop will be emptied; and fecal matters remain in other sections of the colon.

Since bowel movement depends so largely upon the stimulus derived from eating, it is evident that regularity of bowel movement depends upon regularity of eating.

If a full meal cannot be taken, some fresh fruit, as an apple or two, or a couple of oranges, may serve the purpose to maintain the normal rhythm. When strong stimulation of the colon is needed a bran biscuit may be added with advantage, together with a dose of paraffin.

Tea and Coffee

Tea and coffee contain two substances the poisonous effects of which are well known, viz: caffein, a nerve poison practically identical with uric acid, and tannin, an astringent well known as one of the constituents of oak bark and many other vegetable substances.

Everyone is familiar with the use of astringent or tannin-containing remedies in diarrhea. However beneficial tannin may be in cases in which the bowels are abnormally active, certainly its effects are nothing but pernicious when habitually used. The average civilized man requires stimulation of his food

tube rather than the use of substances which produce a paralyzing effect.

Insufficient Fluid

Most persons who suffer from constipation habitually drink too little water. Women drink less than men. It is difficult to account for this scanty use of a necessary of life, which costs little and is of such inestimable value to the body. Water is far more immediately necessary for the support of life than is food. A man may live six weeks or two months without tasting food in any form, but a few days at the most is the limit of human life without water. The consequence of a scanty use of water is abnormal dryness of the feces, which delays their passage through the lower colon, and often causes an actual stoppage in the pelvic colon or the rectum.

Persons who sweat much, either as the result of hot weather, vigorous exercise, or hot baths, are likely to suffer from constipation, unless special care is taken to supply the body with water sufficient to make good the loss. The skin ordinarily throws off as perspiration an ounce and a half of water each hour, or

more than a quart in twenty-four hours. By active exercise or sweating baths this amount may be increased to thirty or forty ounces in an hour. The kidneys excrete two to three pints daily. It is evident, then, that care must be exercised to replace the water that is lost through the skin and kidneys.

In diabetes there is a great loss of water through the kidneys. This, also, must be made up by drinking. If these losses are not made good, the thirsty tissues will absorb as much water as possible from the feces, thus causing hardening and retention in the lower bowel.

Scanty and highly colored urine is an evidence that the tissues are in need of water. Dryness of the skin often testifies to the same need.

Water should be taken in proper quantity irrespective of thirst. It may be made palatable by the addition of fresh fruit juices.

For the average person a good plan is to take a couple of glasses of water on rising, and the same amount before retiring at night. A glassful should be taken half an hour before dinner and supper, and an equal amount two hours after eating. The free use of or-

anges or orange juice, and of other juicy fruits, serves the same purpose as water drinking, to the extent of the liquid which they supply.

Persons suffering from obesity or diabetes are sometimes restricted in the drinking of water, with the result that constipation is produced, if this condition does not already exist. This should never be done.

In all cases in which there is a tendency to dryness of the stools, water should be taken in increased quantity. It is important in such cases, also, to diminish the amount of salt eaten. The addition of salt to the food creates thirst for water to dissolve it and to aid in its elimination through the skin and the kidneys.

Children, as well as adults, need much more water than they are usually given. Meat eaters and those who use salt freely require a much larger amount of water than do those who adhere to a low protein dietary and who use little salt.

Irregular Sleep

The resumption of bodily activity on rising in the morning is one of the important means by which the bowels are made to act with

regularity, by stimulating the colon to empty a portion of its contents into the rectum. When the hours of sleep are irregular, and especially when insufficient time is devoted to sleep, this physiological stimulus is lacking, and constipation may be one of the evil consequences resulting. Loss of sleep causes loss of appetite, thus diminishing the normal stimuli to bowel movement, and so easily leading to constipation. Even when the bowels do not move soon after rising, the stimulus of rising after a good night's rest at least aids in the filling of the pelvic loop, which then only requires the stimulus of breakfast to cause a normal bowel action. Regularity of sleep is almost or quite as necessary for regular bowel movement as is regularity of meals.

Loss of sleep causes constipation by producing a spastic state of the colon, as already noted.

Incorrect Breathing

A child does not have to be taught to breathe. It breathes instinctively and hence correctly, for all natural instinctive movements are physiologically and efficiently performed. But the breathing muscles are vol-

untary muscles, and hence may be controlled by the will. This fact permits modifications of the act of breathing, which may or may not be physiological. Unfortunately, the conditions of civilized life are such as lead to serious perversions of the breathing process. Normally, when air is inhaled the whole chest is enlarged, but the chief movement is at the lower sides of the chest. This broadening of the chest at its lowest part stretches the diaphragm and thus gives it an opportunity to exert its greatest force. Its form being arched, this is highly important. If its ends are held in place, the top of the arch can descend only a little, and while breathing is ineffective, the lungs being imperfectly expanded, the compression of the abdominal organs is equally inefficient. The diaphragm, it must be remembered, is a double acting pump. It creates a suction in the chest, while at the same time it produces pressure in the abdomen. If its work is imperfectly done in one direction, it fails equally in the other.

The compressing movements produced by the diaphragm at each inspiration are, when efficient, of great service in assisting the move-

ments of the food along the alimentary tube. Acting upon the stomach, which lies just beneath it, the diaphragm churns the food and aids in pushing it along into the intestine. Acting upon the colon, which on the left side lies in contact with it, the diaphragm renders great assistance in helping push the food along toward the rectum.

But it is especially in the act of defecation that the action of the diaphragm is important. The very first step in the process of unloading the bowel is in the sinking of the colon by a very deep breath. If the sides of the chest are compressed by belts or a corset, so that they cannot expand, the diaphragm cannot descend more than a short distance, and its action is inefficient. As a result, the fecal matters stored up in the descending and pelvic colon are not pushed onward to the rectum, and the bowel is only partially emptied. Thorough natural bowel movement is not possible without free and vigorous movement of the diaphragm.

So, too, if the diaphragm is weak because of habitual shallow breathing, the result of a bad position in sitting at work or study, the

same result follows. A position which hampers the movements of the chest thus leads to constipation.

The ordinary house chair, especially the rocking chair and easy chairs in general, train the body in unhealthy attitudes and compel shallow breathing. When the chest is depressed, as when sitting in a hollow-backed chair, the abdominal muscles are relaxed, and the diaphragm cannot act well.

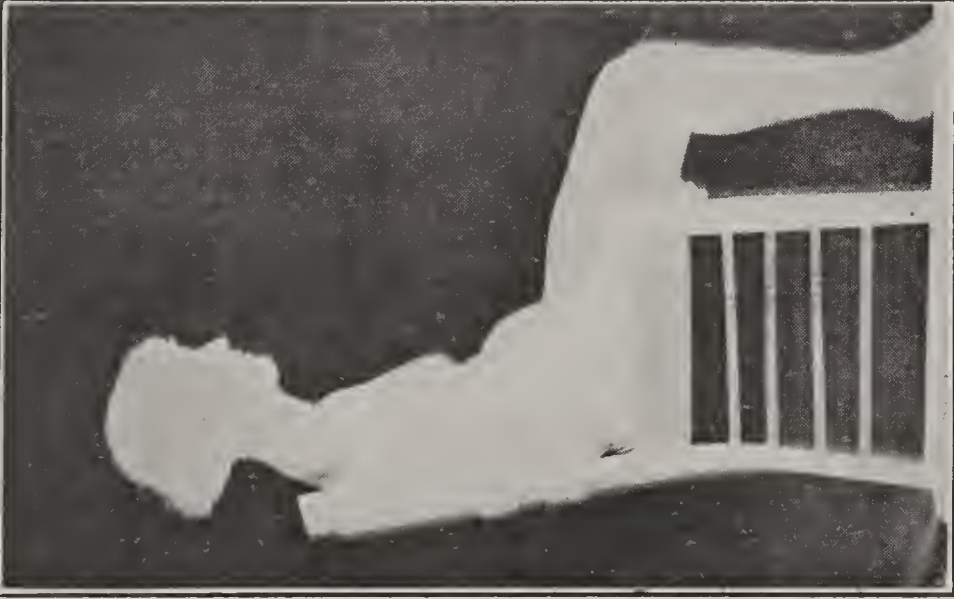
When, on the other hand, the chest is raised, as shown in the accompanying cut, the abdominal muscles are stretched, they are thus made tense, and the colon is kept under constant pressure, by which its contents are moved along at the proper rate; and when defecation occurs, these tense, well-developed muscles, together with the diaphragm, are ready to do their necessary part of the work.

Deficient Exercise

The relation between exercise and breathing and the necessity for vigorous and untrammelled action of the diaphragm have been already referred to in the preceding paragraphs. Exercise promotes bowel action, not



A Correct Sitting Posture in a Badly
Constructed Chair
(Shadowgraph)



A "Slumped" Sitting Posture
(Shadowgraph)



A Disease-Producing Chair



A Health Chair

only by aiding respiration and inducing vigorous movements of the diaphragm, but by calling into strong action the muscles of the abdomen, and by raising the general muscular tone of the body.

The excellent effects that walking has upon bowel activity are well known. Riding is also of great advantage in the same way. These exercises, as well as many others, mechanically stimulate the colon as well as all parts of the intestinal tract, by communicating to it a continued series of slight shocks, by which reflex movements are excited. The active play of children is as necessary to maintain proper bowel action as for muscular development. The movements of skipping, hopping, jumping are especially useful because they induce sudden vigorous contractions of the abdominal muscles and vigorous diaphragm movements by which the colon is compressed and stimulated. The folk dancing of the Middle Ages, which has been revived in recent years, is for the above reasons to be highly commended as a health measure. It is important, however, to make a clear distinction between the varied and vigorous movements of the folk dance, in

simple dress and under wholesome conditions, and the monotonous and restrained movements of the social dance, in full dress and under conditions always physically, and not infrequently morally, unwholesome.

Those whose occupations are such as to give them plenty of exercise are fortunate in being able to lead lives which in large measure conform to natural requirements. Such persons never need suffer from constipation if they eat proper food, drink an abundance of water—at least three to five pints daily—and take care to give the bowels an opportunity for movement after each meal, and promptly whenever there is a “call” for evacuation.

Those who are compelled to lead sedentary lives, and especially women, whose lives are nearly always more or less sedentary in character, must take daily and regular exercise of a sort calculated to benefit the bowels if they would escape the evils of constipation and its secondary results. Some of the special exercises which have been shown by experience to be of greatest service in combating constipation will be described in a subsequent chapter. The exercises of greatest value are those

which strengthen the abdominal muscles. A spring abdominal supporter will usually render great service (page 298).

Resisting the "Call"

The practice of resisting the "call" of Nature to discharge from the body accumulated wastes and rubbish is almost universal among civilized people, as the result of refinement of manners and modesty which lead to the concealment of certain animal functions as much as possible. That this is the result of what is commonly called false modesty cannot be denied, and yet there are few who would desire that this so-called false modesty should be altogether laid aside. It is important, however, that every person, children as well as adults, and at a very early age, should be fully instructed respecting the evil results of resisting and thus thwarting one of the most important of the bodily functions.

The "call" signifies that the pelvic colon is full of feces, and that a sufficient amount of fecal matter has been pushed down into the rectum to arouse the center of defecation and cause it to set in operation the automatic proc-

esses concerned in bowel movement. The colon is contracting, and there is a tendency for the anus to relax, which must be forcibly resisted to prevent immediate discharge of feces. The feces are normally stored in the pelvic colon, the portion which lies just above the rectum. So long as they remain here, there is no desire for movement, but when a portion of fecal matter has been pushed down into the rectum, the time for evacuation has come, and the fact is indicated by a more or less urgent "call." When the feces are fluid, they reach the lowest part of the rectum at once, and the "call" is a very urgent one; but if they are of greater consistency, they are at first retained in the upper part of the rectum, and the "call" is less imperative, and may be suppressed by resistance.

If, for any reason, the bowels are not permitted to move at once, the "call" usually disappears after a few minutes, and may not reappear until after the next meal or even the next day. In the meantime, the feces which have entered the rectum lie there, and through the absorption of water by the intestines become each hour drier and harder, so that

when the "call" comes again as the result of more feces being forced into the rectum and further distention produced, evacuation may be difficult or impossible without mechanical aid.

It is possible, also, that the fecal matters which have been carried down to the lower part of the colon may be returned. It is not probable that this occurs to any great extent, however, for new installments of feces are continually coming down from the upper part of the intestine, and hence the feces simply accumulate, first in the pelvic colon, then in the iliac and ascending colon, and finally in the transverse colon, and even in the cecum and ascending colon.

Although the bowels may be permitted to move when the next "call" occurs, the colon may not be fully emptied. The colon contents may by this time have become so dry and hard that the colon cannot be emptied by an ordinary effort. Thus there is left a residue in the pelvic and descending colon, which is likely to increase from day to day, or at least as often as there is failure promptly to answer the "call" to evacuation.

As the necessary result of this gradual accumulation, the pelvic loop of colon becomes distended more and more. This fact accounts for the variation in the size of this part of the colon which is far greater than in any other part. The late Dr. Byron Robinson, of Chicago, found in two hundred carefully measured pelvic colons a variation in length from five inches to thirty-three inches. The writer has several times encountered at the operating table cases in which the pelvic colon was fully two feet in length.

This stretching may extend to other parts, affecting chiefly, of course, the movable parts of the colon. The transverse colon often becomes loaded with delayed and dried feces, which in thin persons may be felt as hard irregular masses lying in the region of the umbilicus.

The cecum is also often found greatly distended as the result of this hoarding of feces by resisting the "call." It is very probable that the fecal matters are sometimes forced back into the transverse colon and the cecum by the strong contractions of the colon in attempts at defecation. When a "call" is expe-

rienced, there are at once set up colon contractions which would expel the feces if permitted to do so; but as the anus is held closed by voluntary contractions, the feces cannot be forced downward after the pelvic colon is filled, and the natural result is a slipping back of fecal matters into the first half of the colon, some portion even reaching the cecum.

By resisting and ignoring the kindly hint of Nature, that the body requires an opportunity to dispose of its poisonous wastes and refuse, thousands, perhaps we should say millions, of men and women have brought upon themselves untold miseries, and have shortened their lives and have greatly impaired their efficiency and usefulness. Not a few persons are almost at once conscious of injury. A dull headache appears. There is less appetite than usual for the next meal. Sleep is less sound and refreshing. The urine has a stronger odor, and the breath is offensive. These are simply the evidences of poisoning by absorption of toxins. The absorbent process which dries out and hardens the feces, carries with the water that is taken up and poured into the

blood, quantities of poisons which it holds in solution. These poisons overwhelm the liver with unnecessary labor, tax the kidneys, and disturb every bodily function.

The prompt evacuation of the bowels in response to Nature's "call" is a sacred obligation which no person can neglect without serious injury. Ignorance of this fact is one of the chief causes of the prevalence of constipation, a condition in which the body becomes a storehouse of the most disgusting and offensive material, which saturates the tissues with its horrible effluvium and its virulent poisons and taints the very springs of life.

This fault is perhaps more common in America than in any other part of the world, especially in the cities. In English, German, French and Austrian cities, places are abundantly provided where well kept toilet conveniences are offered at a very small cost. One sees often in Vienna such notices as the following: "Urinal free. Seats, one 'heller' (a farthing or half cent)." The toilet arrangements at railway stations are sanitary and well cared for. There is room for great improvement in this particular in this country.

Mothers should give more attention to the bowel habits of their children. School teachers, at least in the primary grades, should instruct their pupils concerning the importance of giving prompt heed to the "call" of the bowels for attention. Among savages this function receives much attention. A missionary physician tells of an Arab who declined to live in Aden because the city regulations required that the bowels should be evacuated only in certain places, as in all civilized communities, rather than anywhere at any time the "call" demanded.

The worst result of these habits of postponing attention to the bowels to a convenient time, is that the "call" after some time ceases. It is no longer made; or, if made, is so faint that it is not recognized. The continued pressure of the mass of hardened feces upon the nerves of the rectum destroys their sensibility, so that the reflex is no longer in operation. The defecatory center is not notified that evacuation is necessary, and the accumulation of feces continues with no remonstrance. Quite a large proportion of chronic sufferers from constipation reach this condi-

tion before they really begin to give serious attention and study to the matter.

There are thousands of persons who never experience a desire for evacuation of the bowels except after taking a laxative. The cure of cases of this sort is one of the most difficult problems connected with this class of disorders, but with the thorough co-operation of the patient the normal "call" may be restored by patient application of the proper measures. No victim of this condition should rest contented until this has been accomplished. For the body to be deaf to the needs of its sewage system, by which its most poisonous waste matters are removed, is a far more dangerous and serious condition than for it to be deprived of the sense of hearing. Fortunately this condition, serious as it is, may usually be relieved by the use of simple means.

Hurried Defecation

The act of defecation normally occupies but a few seconds. The colon acts with so much celerity that when watched under the penetrating X-rays its movements can scarcely be followed by the eye. There is a vigorous

surging which passes in waves from one end of the colon within a few seconds, and then the colon is at rest; but it is easily seen that the contents have either disappeared or have been moved forward. After a normal movement, the colon is empty from the splenic flexure down, and there is seen to have been a forward movement of feces in other parts of the colon.

There are, however, so many persons who are not quite normal, even though apparently healthy, that perfectly natural bowel movements are probably the exception rather than the rule among civilized adults. It often happens, at least after the first portion of feces has been expelled, that a second or even a third installment is brought down, and a second or third action of the colon occurs. The pelvic loop of the colon has in most people been so much abused by resisting the "call", and so compelling an accumulation there, that it is often so greatly dilated or so much folded upon itself that two or even three efforts are necessary for its complete evacuation. To accomplish this requires a little patience, and sometimes a great deal of

persevering effort. The first partial movement empties the rectum and the lower part of the distended pelvic colon. By waiting and repeated effort, aided perhaps by pressure with the hands upon the lower abdomen on the left side, an additional portion of feces may be forced down into the rectum. This excites the center of defecation, just as touching the back of the throat excites the vomiting center, causes the colon to contract, the anus to open, and a second bowel movement results. In like manner, a third or even a fourth installment may sometimes be secured.

But this requires time, perhaps five, ten or even fifteen minutes. The bustling or worried business man, the hurried clerk, the student who has barely time to reach his school before roll call, the housekeeper who is perhaps superintending some important culinary operation, these and a thousand other busy individuals believe that they have not time to devote to a function looked upon as grossly animal and repulsive, and so it is cut short at the earliest moment possible.

Ignorance of the consequences does not, however, prevent the evil effects which cer-

tainly follow such neglect. The feces left behind in the half-emptied pelvic colon become so dry and hard before another opportunity for evacuation occurs that the difficulty is greater than before, and so a considerable quantity, often an increasing amount, of feces is held back, and cumulative constipation is established.

Undue haste in bowel movement is also encouraged by unsuitable toilet arrangements. In many places, especially in country districts, the insufferable "privy" still exists, and is a most prolific source of misery. The use of such a place for evacuation of the bowels is at all times more or less inconvenient and offensive, and on this account is avoided as much as possible, leading to neglect of the "call," and when necessity compels the use of the offensive place, the visit is made as brief as possible.

In cold weather, the danger of injury from exposure of the unprotected body to a low temperature, sometimes even zero weather, is very great, especially in the case of feeble or delicate persons. Extreme cold also tends to prevent effective defecation, by contracting

the anal muscles so strongly as to negative the effect of the automatic reflex by which the outlet is normally opened.

The toilet should be conveniently placed, and should be made as warm and comfortable as a bathroom. It should be kept in so neat and sanitary condition as to be in no way offensive.

The time should be sufficient for complete emptying of the descending and pelvic colon. All fullness and weight in this region, as well as the sense of fullness in the rectum, which commonly prompts to bowel movement, should disappear after defecation. If necessary to occupy the mind by glancing over a morning paper, this will do no harm provided that it is not allowed to interfere with the muscular efforts which may be necessary to force down into the rectum from the pelvic colon a sufficient amount of feces to induce an expulsive action of the bowels.

Unnatural Posture in Defecation

The natural position in defecation is squatting or crouching. All savages assume this attitude in moving the bowels. The reason

for this, as has been fully explained in a preceding chapter, is that in the natural position the abdomen is compressed by the thighs, and thus the feces are forced into the rectum, and so the automatic process of bowel movement is set going.

The ordinary water closet is so constructed that natural bowel movement is impossible in its use. By bending strongly forward, some compression of the thighs may be effected, but it is only in the squatting position that the pressure can be as great as is possible and often necessary. By placing a low platform in front of the closet so as to raise the feet eight or ten inches, this objection may be very largely overcome. Some closets are now made low and sloping with this idea in view, and are a great improvement over the old style.

Many surgeons have learned the importance of the squatting position to secure complete evacuation of the bowels and bladder, and forbid the use of the bed pan in any except the feeblest cases, requiring the patient to be supported as may be necessary while using the chamber.

Although this matter is one of very great importance, it is more than likely that half a century will pass before manufacturers and plumbers, upon whom we are dependent for these necessary conveniences, recognize to any appreciable extent the need of a change in closet construction.

The Use of Tobacco

Numerous laboratory experiments have shown that the use of tobacco in any form has a paralyzing effect upon the splanchnic nerves. Without the aid of these sympathetic nerves, normal, rhythmical bowel movements are impossible. The fact that some persons observe an apparently favorable influence from smoking, is accepted as evidence that the effects of the weed are favorable to the bowels. These cases are exceptional. In general, the use of tobacco is highly injurious to the intestine. Kreuznach, of Vienna, has recently shown that nicotine produces arteriosclerosis of the splanchnic vessels. That is, it produces hardening and degeneracy of the vessels which supply the colon and other abdominal organs. This change in the blood vessels gives

rise to general degeneracy and atony, and hence to constipation, by which it is always accompanied.

Alcohol and Other Narcotic Drugs

Alcoholic beverages of all sorts tend to produce constipation, by causing chronic intestinal catarrh, ulcer of the stomach, and paralysis of the sympathetic nerves.

Opium in all forms produces a specific effect in paralyzing the bowels. In former times it was customary to administer opium in sufficient doses in certain cases to cause complete inactivity of the bowels for a week or more. In such cases the constipation induced was often the beginning of chronic constipation of a most obstinate character.

The very common use of opium for the relief of pain is a prolific cause of constipation, especially among women. The fact that a laxative drug is given to overcome the constipating tendency, does not prevent the evil that results, but only adds another.

Bromides and sleep-producing or hypnotic drugs of all sorts tend to produce constipation, although some of them are less harmful than

opium. Fortunately, the use of these drugs usually may be dispensed with when the resources of hydrotherapy and other physiologic means are made use of.

The Use of Purgatives Aggravates

One of the best evidences of the universal prevalence of constipation is afforded by the enormous use of laxative or purgative drugs. The quantity of this class of drugs used annually far exceeds that of any other class. Besides drugs proper, there is sold a prodigious quantity of laxative mineral waters. It would be difficult in the average community to find a household in which there is not kept on hand a supply of some favorite laxative. The columns of the newspapers are filled with advertisements of drugs which act upon the bowels. Many housekeepers lay in supplies of bowel medicines as regularly as the stock of groceries and other necessities, and medical advice is sought no more in relation to one than the other. Laxative drugs have come to be regarded as staple commodities which stand, next to food and drink, as necessities.

Unquestionably, an inestimable amount of injury is done by the use of these intestinal irritants, most of which are nostrums of the worst sort, providing temporary relief only at the expense of permanent injury.

It is not too much to say that all laxative drugs are harmful. There is no such thing as a harmless laxative medicine.

Laxative drugs act in different ways, and some are more harmful than others. "Salines" impose heavy burdens upon the kidneys, besides irritating the bowels. When long used, they produce an obstinate intestinal catarrh, which aggravates the constipation. Almost without exception, laxative drugs increase the condition which they are supposed to cure. The most difficult cases to cure are those which have long made use of laxative drugs.

Not the least of the damage done by laxatives is the injury to the stomach. The drug is administered by the mouth for the purpose of relieving a difficulty at the other end of the digestive tract, than which it would seem nothing could be more irrational. In a large number of cases of constipation, the whole trouble is a loss of the rectal reflex. The feces

accumulate in the rectum or the pelvic colon because of failure of the discharging mechanism. What could be more really absurd and irrational than to irritate and worry the stomach and the whole twenty-five feet of small intestine, besides the cecum and the greater part of the colon, just for the purpose of exciting to action the last six inches of the intestinal tube, the rectum?

As we shall see in the further study of this subject, constipation is not a disease, but only a symptom. The morbid condition upon which the symptom depends may be any one of a score or more of things, or several in combination. For the most part, these conditions, as we shall presently see, are such as are certain to be greatly aggravated by the use of laxatives or irritants of any sort.

The use of laxatives as a routine measure, a practice which is almost universally in vogue with the profession as well as with the laity, is most illogical, and is productive of a prodigious amount of injury.

The use of laxative drugs must be regarded as one of the most certain and prolific causes of constipation, and a person who has once

formed the habit of using laxatives must as a rule continue the practice as long as he lives, unless he is so fortunate as to find some one wise enough to show him the way out of his troubles.

The systematic use of purgatives for "cleansing the system," irrespective of the state of the bowels, is a very old custom still in vogue in various places. Nothing could more effectively operate to produce the most obstinate sort of constipation. An excellent illustration of this baneful practice and its results came under the writer's observation a number of years ago. A man past middle life sought relief from a constipation which he declared responded to no drug in any dose. He had taken half a pound of "salts" without effect. The history which he gave revealed the cause of his unfortunate condition. The patient stated that when a child at home it was the practice of his mother to give to each child every Friday night a dose of "salts" as a sort of house-cleaning process to prepare the family for the proper observation of Sunday—whatever that may have meant. The result was that after a few years the weekly dose

was quite insufficient, and daily doses of increased size became necessary. The dose increased from year to year, and new remedies were adopted as one after another ceased to be effective, until the whole list of laxatives had been exhausted.

Posture

A habitual posture which relaxes the abdominal muscles and so weakens them by disuse that they lose their normal tone may become a potent cause of constipation. It has been shown that a slowing of the blood movement through the intestine results in a slowing or interruption of peristalsis. The mass movement of the colon which takes place normally during or immediately after a meal is without doubt due to the quickening of the circulation which occurs as the result of the entrance of food into the stomach by which the whole digestive system is excited to activity. The increased movement of blood through the intestines during digestion is so great that other forms of bodily activity are often more or less interfered with, particularly the activity of the brain, which,

when in vigorous action, requires one-fifth of the total blood supply of the body.

Students, writers, bookkeepers, seamstresses, most professional men and most persons whose habits are sedentary or who sit much at their work are likely to assume a relaxed position as shown in the accompanying cuts. This posture robs the abdominal vessels of the mechanical support which they require from the abdominal walls. Persons who habitually sit in this relaxed attitude retain the same attitude when on their feet so that the abdominal blood vessels are constantly filled with stagnating blood, the natural result of which is a deficient activity of the intestines and an abnormal accumulation of food residues in the colon. Many persons who are habitually constipated observe that the bowels move regularly and several times daily when much exercise is taken, as during a vacation outing. This fact emphasizes the importance of exercise not only as a means of preventing constipation but as a means of cure.

Horace Fletcher's Error

About twenty years ago (1902) Mr. Horace Fletcher began his chewing campaign and by his enthusiastic advocacy of the value of thorough mastication of the food induced many thousands of people to give more attention to the manner of taking their food.

Mr. Fletcher was right in his estimate of the value of thorough mastication of the food, though he was wrong in supposing much chewing to be a rule of universal application. In cases of hyperacidity, in which the stomach makes an excess of gastric acid, the food should be chewed as little as possible, since more chewing makes more acid. But, of course, the food must be prepared in the form of purée, so that chewing is not needed for mechanical preparation.

Mr. Fletcher somehow hit upon the idea that it was essential that all the food should be made liquid *in the mouth*, and that any part of the food which could not be reduced to liquid form in the mouth should be discarded. This idea was not included in his discoveries about the discriminating power of

the gustatory nerves, and was not a legitimate inference from the demonstrated value of thorough chewing; it was a pure supposition or hypothesis, or perhaps we should say mere conjecture. But Mr. Fletcher attached to this assumption all the importance of a demonstrated truth, and dwelt much upon it. This most unfortunate error was his undoing. It led him to avoid foodstuffs which contained insoluble substances, such as the seeds and skins of fruits, and to restrict his dietary to soft foods, soups, purées, and liquid foods.

One result of the use of soft foods which required little chewing was rapid decay of his teeth. On his various visits to Battle Creek, he was constantly in the hands of a dentist, who told the writer more than once that he was astonished at the bad condition in which he found Mr. Fletcher's teeth, and at the rapidity with which they were undergoing decay.

But another and a still more serious result of the soft diet, wholly free from indigestible elements, was a most obstinate constipation. Mr. Fletcher told me on several occasions that his bowels moved only once or twice a week.

After a time Mr. Fletcher came to look upon this chronic constipation as a great advantage, and as a proof of the virtue of extra mastication. He argued that thorough chewing secured such perfect digestion and such complete absorption and utilization of the food that there was left no residue for germs to act upon, and so was a sort of sterilizing process. As proof of this, he offered the fact that the small hard stools which he dismissed from his colon at intervals of several days were almost odorless. As a convincing argument, he one morning came into my office and, pulling a handkerchief from his coat pocket, opened it and presented a small brown mass less in size than his thumb, and remarked, "This is my morning stool, and you will see that it is free from odor." Then, thrusting a hand into another pocket, he drew out two other brown rolls of similar appearance saying: "Here are two stools which I have been carrying around as pocket pieces for several months. As you will see, they are wholly free from odor." His face was beaming, and he evidently felt that he had achieved a triumph in food economy.

Mr. Fletcher was so carried away with this idea that for some time, at least, he made quite a hobby of it, and it came to be generally understood that infrequency of bowel movements was a regular part of the Fletcher régime, or "Fletcherism," as he preferred to call it.

Mr. Fletcher's enthusiasm for this feature of his system was somewhat cooled, however, by a circumstance reported to us by a New York lady magazine writer, who stated that on one occasion when he was explaining "Fletcherism" to a group of New York club women, he exhibited and passed around his specimens, or attempted to do so, but failed because the ladies fled in dismay.

The writer labored long and often with Mr. Fletcher to convince him of his error, the evil effects of which were made evident by his badly coated tongue and bad breath, as well as by the rapid decay of his teeth and other indications of pronounced autointoxication. All of my efforts were unavailing, however, for several years.

In the meantime, Dr. Van Someren, Mr. Fletcher's son-in-law, made a visit to Battle

Creek. His condition was found to be still worse. He remarked one day, that the management of his bowels was a great trouble. His bowels moved only once a week and sometimes less frequently. He was very neurasthenic, and was evidently suffering greatly from toxemia, which led to his death a year or two later.

Finally, I succeeded in inducing Mr. Fletcher to submit to a "motility test." The test consisted in giving a quantity of finely pulverized charcoal, so as to impart to the food residues a black color, and by this means determine the length of time required for it to pass through the alimentary canal. The charcoal was given at breakfast. The next morning Mr. Fletcher called for me early and asked me to come to his room. He was greatly disturbed. "Doctor," said he, "what was that medicine you gave to me? It must have been something dreadful. I fear it poisoned me. It got me up at four o'clock this morning, and a bowel movement occurred, and the material passed had a most loathsome and disgusting odor."

It was by no means easy to convince him

that the bad odor was due to the putrefaction of bile and other excretions which had been retained for days in the cecum after they should have been dismissed from the body. Of course, the only possible effect of the charcoal had been to lessen the odor, although it had apparently stimulated activity of the bowels, producing a laxative effect because the colon had been so long unused to the contact of insoluble or indigestible residues.

I explained to Mr. Fletcher the fact pointed out by Bouchard, that the bile is a highly poisonous excretion, being six times as toxic as urine. I also called his attention to the fact that both bile and intestinal mucus are putrescible substances, and that putrefaction always occurs when there is long delay in the colon. He still held to his thesis, however.

Having now the positive proof that he was absolutely wrong in his contention, and that his hard stools were odorless only because they had been retained so long that the malodorous indol and skadol had been almost wholly absorbed, I did not hesitate to take a strong and open stand against this feature of

his theory. I had frequent occasion to do so because of inquiries from patients who had suffered from the constipating effects of "fletcherizing," that is, thorough chewing of the food and rejection of all insoluble residues. Many persons who were forced to abandon "fletcherizing," because of the resulting constipation and autointoxication, supposed that the evil effects they suffered were due to chewing; whereas it was, instead, due to rejection of the insoluble residue which is a necessary element of our food to furnish the needed bulk for stimulation of the intestine. Said the late Professor William James, who was for a time one of Mr. Fletcher's most enthusiastic converts, "I had to give it up after a three months' trial. It nearly killed me."

I deem it just both to Mr. Fletcher and myself, to write thus frankly, for he gave wide publicity to the fact that I endorsed his ideas of chewing, but did not mention my protests against his idea of the value of colon inactivity.

The last time I met Mr. Fletcher was at the Lotus Club in New York on the occasion of his last visit to this country. I was struck

with the rapidity with which he had aged since I last met him. He looked highly toxic. I undertook once more to expostulate with him about his insistence upon the rejection of insoluble residues in his food, and cited various instances of injury from the following of his teaching. He seemed to be more open-minded on the subject, and after returning home I received a letter from him in which he referred to bran in a way which led me to infer that he was making use of it as a laxative, and he added that his bowels were moving daily.

I have reason to believe that at last Mr. Fletcher saw his error and endeavored to correct it, at least as far as his own habits were concerned. But, unfortunately, it was too late. The mischief had been done. His vital stamina to resist disease had been exhausted by many years' struggle against colon poisons.

Mr. Fletcher's experience inculcates the lesson that there is no panacea for the ravages of time. Long life cannot be made sure by any simple formula. Thoroughgoing obedience to all the laws of "biologic living" is the price which must be paid.

DISORDERS OF THE DIGESTIVE TUBE ASSOCIATED WITH AND CAUSING CONSTIPATION

The disorders of the alimentary canal, which give rise to constipation, are very numerous. Some are purely functional in character, others are organic or structural affections. All are of a nature which cannot possibly be more than temporarily relieved by laxative drugs, and most are likely to be made worse by their use, a fact which shows the folly of depending upon them for the relief of this condition, which, unfortunately, is rarely treated in any other way.

Reverse Peristalsis the Explanation of Many Gastric Symptoms

Recent observations by Grützner, Bernheim, Alvarez, Case, Boldyreff and others show that the normal peristaltic movements of the alimentary tract, by means of which foods and food residues are moved progress-

ively from the mouth to the outlet of the anus, may be reversed. Strong antiperistaltic movements have frequently been observed in the colon. These movements usually start from the center of the colon. Case and others have observed movements beginning near the lower end of the colon when this part of the bowel was distended. Case has reported cases in which the reflux has extended even to the duodenum. Treves, the London surgeon, reported a case in which castor oil and water colored with an aniline dye were vomited within ten minutes after they were introduced by enema into the colon. The surgeon thought such rapid movement of liquids from the rectum to the stomach must be impossible without the existence of an opening connecting the stomach with the colon. He accordingly operated, but to his surprise found the stomach and intestines to all appearance perfectly normal. A number of other similar cases have been reported. In these cases the reverse movement of the intestine is apparently even more vigorous than the ordinary peristalsis in the normal direction. Such rapid antiperistaltic movements

are doubtless very rare. There is accumulating evidence, however, that a very slow, almost imperceptible, reverse peristalsis is an exceedingly common phenomena and is the real cause of many of the symptoms associated with disorders of the stomach.

These reverse movements may be caused by various morbid conditions, especially by chronic appendicitis, disease of the gall bladder, duodenal ulcer, pregnancy, diseased conditions of the womb and ovaries in women and of the bladder and prostate in men; but the most common of all causes appears to be the accumulation of food residues in the colon. Chronic constipation, or intestinal stasis, is thus shown to be the cause of most of the disorders of the alimentary canal as well as the origin, through intestinal toxemia, of a vast number of general disorders. Alvarez inclines to the opinion that the disturbances caused by fecal accumulations in the colon are chiefly of a mechanical nature, while others hold to the view that the principal factor is the absorption of poisons resulting from the putrefactive changes which are always associated with delay of food residues in the colon.

The probable truth is that both of these factors are active. It is certain that relief of constipation and changing the intestinal flora are the most effective means of combating many of the most annoying symptoms connected with the stomach and intestines as well as the various conditions commonly attributed to intestinal toxemia or autointoxication.

A great mass of facts demonstrated by laboratory research and culled from clinical observation has been cited by Alvarez in support of the views above advanced. The conclusions reached with reference to the causes of the various symptoms commonly associated with disorders of the stomach may be briefly summarized as follows:—

Vomiting

Vomiting is undoubtedly the result of a reverse movement of the intestine. During X-ray observations, peristaltic waves have been seen to pass from the duodenum to the stomach, and it is impossible to account for the vomiting of fecal matters and substances introduced experimentally into the rectum except by the occurrence of reverse peristalsis.

It was noted by Hippocrates that purging usually ceases when vomiting begins. Purging has even been treated by the administration of emetics, and it has been found possible to nourish pregnant women suffering from prolonged vomiting by introducing nutritive enemas, which were doubtless carried from the colon into the small intestine. Feeding in this manner will, of course, be facilitated by incompetency of the ileocecal valve which exists in a large proportion of patients who have long suffered from constipation. Regurgitation, as Alvarez suggests, is simply mild vomiting. The reverse peristaltic waves are too slight to produce the violent movements of vomiting, so that only small quantities of liquid are lifted. Distention of the colon causes it to give rise to reverse waves of sufficient intensity to reach the stomach, although with a force barely sufficient to lift from the stomach to the mouth small quantities of the stomach contents. The material lifted to the mouth may be either fresh food in which the process of digestion has not yet been begun or highly acid gastric juice from the lower part of the stomach, or even duodenal fluids, bile

and pancreatic juice which, when the pylorus is open, may be carried upward along the lesser curvature of the stomach to the esophagus.

Nausea and Aversion to Food

Nausea without either vomiting or regurgitation is another symptom of mild reverse peristalsis. The accumulation of fecal residues in the colon is undoubtedly the most common cause of nausea, although it is entirely possible that the toxins absorbed from putrefying residues in the colon may also give rise to nausea.

Aversion to food may also be the result of many different causes, both mental and physical. There is, however, good reason for believing that in many cases, perhaps the majority of cases, the lack of appetite is but a mild manifestation of the interruption of the normal progress of food or food residues along the intestinal tract. Cannon demonstrated long ago that when obstruction occurs in any portion of the bowel there is at once stoppage of movement in the higher lying parts. It has often been noted that the stom-

ach ceases to pass its contents into the intestine when the intestine lower down is overfilled. A colon overfilled with residues thus becomes a cause of gastric disturbance, the emptying of the stomach is slowed and the hindrance may be so great as to produce not simply a lack of inclination to the taking of food but a complete aversion to food of any sort. This aversion may extend even to liquids. The writer has frequently observed that persons suffering from extreme intestinal toxemia usually drink very little and find it difficult to swallow more than small quantities of water. This aversion to food and drink may be in part due to the influence of putrefactive toxins upon the hunger center and the appetite center, but since Cannon has shown that hunger is due to contraction of the stomach it is entirely reasonable to believe that the slowing of the gastric movements or reversal of these movements may be the principal cause of loss of appetite and of the feeling of nausea which is often associated with the lack of appetite.

A Sense of Fulness

Chronic dyspeptics often complain of difficulty in eating because of a "sense of fulness" which appears shortly after a few mouthfuls of food have been eaten. Cannon, Carlson and other observers have shown that the normal stomach gradually enlarges to accommodate the increasing volume of contents during the intake of food. This appears to be brought about by a reflex action which causes gradual relaxation of both the gastric walls and the muscular walls of the abdomen. This reflex appears to be interfered with by a mild reversal of the normal peristaltic movements. Distention of the colon may well give rise to this condition. In duodenal feeding the too rapid introduction of foods will quickly develop the sense of fulness in the stomach although no food whatever has entered the stomach. It is quite possible that disease of the gall bladder, ulcer of the duodenum or a chronically inflamed appendix may be a cause of these reverse movements; but in the great majority of cases chronic constipation may be held responsible for this condition. By waiting a few moments, especially by di-

version of the mind from the condition present, as by pleasant conversation or the reading of the morning paper, the symptom will pass off and eating may be resumed. Worried mothers and mentally depressed business men often complain of this symptom. In these cases the explanation may be easily found through the depressing effect of the mind upon the activity of the colon and the resulting stasis.

Belching

Alvarez points out there are three kinds of belching: (1) A slight gurgling sensation felt in the esophagus; (2) the eructation of gas from the stomach; and (3) a movement of air downward into the stomach or a voluntary or semi-voluntary swallowing of air. Observations made by the writer, Dr. Case and others have clearly demonstrated that so-called belching is in the majority of cases simply the swallowing of air or the eructation of air which has been swallowed. It should be remembered, however, that this is not simply a vicious habit which has been voluntarily acquired, but is an effort on the part of

the patient to relieve a feeling of discomfort experienced in the stomach. The condition seems to be similar to that which sometimes gives rise to hiccough. Not infrequently hiccough and belching are associated. It is probable that in many cases the gastric discomfort is the result of a reverse peristalsis which brings gas or liquid into the stomach. Swallowing of air opens the upper orifice of the stomach and so permits some of the gastric contents to escape and thus affords momentary relief. It is well known that gas is rarely generated in the stomach by fermentation. Gas in the stomach is either swallowed or brought up from the intestine by reverse peristalsis.

Instead of seeking relief by the swallowing of air, persons suffering from this inconvenience may obtain relief by sipping a glassful of very hot water, perhaps with the addition of a little soda. This will open the upper orifice of the stomach and allow the escape of disturbing liquid or gas and permit the reverse waves to run out as Alvarez suggests, and thus bring relief; but at the same time the real cause of the trouble, which probably

exists lower down in the bowel, must be sought out and removed.

Globus

This very unpleasant sensation felt in the esophagus is known to be the result of violent contraction of the muscular tube. It seems to be the result of the meeting of two peristaltic waves, one coming from above, the other from below. Hysterical patients suffer from globus more than others because they are universally constipated and hence the subjects of pronounced reverse peristalsis. Globus is sometimes a result of an attempt to swallow when a wave of regurgitation is passing upward.

Coated Tongue and Foul Breath

These conditions which accompany biliousness are doubtless in part due to a general lowering of vital resistance with depreciation of the germicidal properties of the blood serum, as a result of which the saliva loses to a certain extent its power to prevent the growth of bacteria in the mouth, which appears to be one of the important functions of this secretion. It appears, however, from the

experiments of Grützner and others that the coating of the tongue, which is known to be due to the growth of bacteria, may be in some cases the result of reverse peristalsis. Grützner showed that bacteria and lycopodium introduced into the rectum in dogs were within a few hours carried to the mouth. Hundreds of bacteriological examinations of the saliva made in the laboratory of the Battle Creek Sanitarium have shown that in a very large proportion of the cases examined, colon bacilli are found present in large numbers.

Since it is well known that the bile frequently enters the stomach during sleep, since it is also known that colon bacilli are frequently found in the bile, it will readily be seen that these pernicious organisms may easily find their way by regurgitation to the mouth; and if the saliva has lost its normal power to inhibit the growth of these organisms the natural result will be an unusual development and the densely coated tongue and foul smelling breath which are found in persons suffering from the condition commonly known as biliousness.

Biliousness

The term "biliousness," while not in a strict sense scientific, nevertheless describes a pretty clearly defined condition with which many people are, unhappily, only quite too familiar. The lack of appetite, sense of *mal-aise*, indisposition to effort, mental or physical, drowsiness, often giddiness, coated tongue, unpleasant taste in the mouth, malodorous breath, inactivity of the bowels, dinginess of the skin, dark circles around the eyes, headache, inability to concentrate the mind, are all symptoms of a state of profound toxemia, the source of which is by the laity universally associated with the liver. It is a common remark of such patients, "If I could only get the bile off my stomach, I am sure that I would be relieved." Not infrequently, attacks of biliousness are periodical and are associated with migraine, or sick headache. Many persons have observed a sense of unusual well-being immediately after an attack in which there has been free vomiting of bile. Many patients have discovered for themselves that an attack of biliousness may sometimes be averted by means of a dose of salts

or free purgation produced by mineral waters or cathartic pills of some sort. It is a common practice with physicians, especially in the Southern States, to relieve or avert an attack of biliousness by liberal doses of calomel. By vomiting or free purgation, a considerable quantity of bile is gotten rid of.

Observations made by Lauder Brunton, Schiff, and others, show that the cause of so-called "biliousness," in many cases at least, is a concentration of the bile which, when not properly discharged, is absorbed and again excreted, thus becoming more and more concentrated. Persons whose bowels move freely and efficiently three times a day will not suffer from excessive absorption and concentration of bile; but constipated persons, including those whose bowels move but once a day, must always suffer from bile absorption, for the reason that the food residues and excretions which are normally discharged in less than twenty hours from the time food is taken, are retained two or three days or even more, giving abundant opportunity for the reabsorption not only of bile, but of other excretions.

Another feature which contributes to the excessive absorption of bile is a deficiency of gastric acid. One of the functions of the gastric acid is to precipitate, or render insoluble, the poisonous pigments and other toxic substances which are found in the bile. These are among the most highly poisonous substances found in the excretions. When the gastric acid is present in sufficient amount, these poisons are thrown down in an insoluble form and are carried off with other waste matters; but when the gastric acid is deficient, these poisons remain soluble and are thus rapidly absorbed. If, in addition to this condition, constipation exists, which is very likely to be the case, the bile poisons will naturally accumulate not only in the bile but in the blood stream and in the tissue fluids, producing a condition which may be called "chronic biliousness."

Even persons who suffer from an excess of gastric acid may have excessive absorption of bile if large quantities of soda are used to neutralize the gastric acid,—a very common practice.

In recent years, a method has been devel-

oped by which the gall-bladder may be emptied and the bile may be withdrawn without purgation. This is known as non-surgical drainage of the gall-bladder. The method consists in the passage of a small tube first into the stomach and then on into the duodenum. The operation is simple and generally gives the patient very little inconvenience. Not infrequently wonderful relief is obtained from headaches and other discomforts almost immediately after the withdrawal of a quantity of bile.

In persons suffering from autointoxication, that is, a condition in which the food residues are permitted to undergo putrefaction in the colon, thus introducing into the blood stream through absorption an excess of poisonous substances with which the liver must deal, there is an unusual tendency known as "biliousness." Indeed, in such cases the condition known as "biliousness" may be continuously present. To the normal bile poisons in these cases are added the poisons resulting from putrefaction. Thus the bile becomes very highly toxic.

The intestinal stasis or constipation asso-

ciated with intestinal toxemia leads to the absorption of a large part of these poisons while awaiting evacuation, and thus a highly active vicious circle is formed.

The permanent remedy for these conditions is to be found, not in the use of laxative or other drugs, but in changing the intestinal flora and such regulation of the diet as will prevent putrefaction of the food residues and will secure such frequent evacuation of the colon as will leave no opportunity either for putrefactive changes to occur or for the undue absorption of bile. When this is accomplished, all the symptoms of biliousness rapidly disappear and do not re-appear so long as normal conditions are maintained in the intestine.

The change of intestinal flora may be readily accomplished by the use of large doses of lactose or dextrine or, better, a combination of these special carbohydrates, lacto-dextrin, which should be used in quantities sufficiently large to flood the entire intestine. The results obtained by this method in hundreds of cases of chronic biliousness have proved in the highest degree satisfactory.

Atony

In operating upon the colon and other parts of the intestine, the writer has often found a very great thinning of the intestinal wall and marked evidence of degeneration of the mucous membrane. The over-action of the mucous glands which is characteristic of colitis naturally, in time, results in degeneration of the mucous follicles and a consequent deficiency of the normal lubricating mucus which is essential for normal bowel action.

It is probable, however, that in the majority of cases of so-called *atony* of the colon, with atonic constipation, the real cause of the inactive state of the colon is to be found in the putrid character of the feces. Putrid feces are always alkaline, usually containing considerable quantities of ammonia. Alkaline substances of all sorts paralyze the colon.

Lack of Appetite

Lack of desire for food is a common result of constipation, and may also be a cause of this condition, when it is the result of some other cause, as lack of exercise, excessive heat, etc. With loss of appetite there is absence of

relish for food, and hence a failure of the meal to awaken those lively peristaltic movements which are essential to propel forward in the colon the hardening masses of fecal matter which are stored up in its lower segments waiting to be discharged. Those who eat without appetite are always constipated, and while the lack of relish for the food encourages the constipation, the latter still further lessens the appetite, and so the difficulty continually becomes more and more aggravated.

Painful Affections of the Abdomen

Pain in almost any part of the abdomen may cause constipation through reflex arrest of peristaltic movement and spasm of the descending or pelvic colon. Cases of this sort usually present very active symptoms of intestinal toxemia. Such persons are often victims of attacks of violent headache. They show much indican in the urine, are likely to have high blood-pressure, and sooner or later develop chronic Bright's disease of the kidneys.

Painful affections of the abdominal organs,

such as chronic appendicitis, colitis, adhesions following an abdominal operation, pelvic or bladder disease, may cause constipation, not only by producing reflex spasm of the colon but by restraining the patient from making the necessary effort to expel the colon contents. Such efforts naturally increase the pain, and so are dreaded and avoided. In such cases the application of a hot fomentation over the seat of pain before ordering the effort to move the bowels will often render very great service. A hot sitz bath may be taken instead. A hot water bag placed against the abdomen may be found useful both by lessening pain and as a mechanical aid to defecation.

Depressing Emotions

Fear, or any depressing emotion may, through the sympathetic nerves, cause reflex constipation. Prof. Anderson, an eminent Danish physiologist who has made an exhaustive study of the influence of the emotions, found that depressing emotions powerfully excite the sympathetic. Some persons are unable to move their bowels because they are

Incompetency of the Ileocecal Valve

One of the effects of chronic constipation is incompetency of the ileocecal valve. By overdistention the intestine becomes so widely dilated that the lips of the valve no longer come in contact and so its check valve action is prevented, and the putrefying contents of the colon readily pass backward into the small intestine. The infection thus induced may travel backward the entire length of the small intestine, to the stomach, liver, gall-bladder, pancreas and duodenum, giving rise to ulcer of the stomach, duodenal ulcer, gall-stones, inflammation of the gall-bladder, infections of the liver and jaundice resulting from these conditions, and pancreatitis, a still more serious condition. It is probable, also, that the worst effects attributed to alimentary toxemia or intestinal intoxication are seen in cases in which, through incompetency of the ileocecal valve, the putrefying materials of the colon find ready entrance to the small intestine, and are rapidly absorbed.

When the ileocecal valve is incompetent, it is of course incompetent to gases as well as liquids. There is evidence that the valve

sometimes becomes incompetent to gases while it still may be competent to liquids. Patients whose ileocecal valves are incompetent suffer from great discomfort because of inability to expel gas from the intestine. When an expulsive effort is made gas passes in both directions, that is, out of the body and back up into the small intestine.

There is reason to believe that the failure of short-circuiting operations either with or without removal of the colon or a part of it, is often due to loss of the function of the ileocecal valve, which is of course removed with the colon. Recent advances in the department of surgery make it possible to remedy this defect by constructing an artificial ileocecal valve. This operation is rarely necessary, however, since methods for changing the intestinal flora have been perfected and made practical.

In like manner incompetency of the ileocecal check-valve interferes with the complete and proper emptying of the colon and thus becomes a cause as well as a consequence of constipation.

The worst evils resulting from incompe-

tency of the ileocecal valve may be corrected in the majority of cases by removing the cause, namely, relieving the constipation to which it is due. While, in a majority of cases, this may be accomplished by the employment of the thoroughgoing measures suggested in this volume, a few cases remain in which an operation is required for breaking up adhesions of the pelvic colon and removing the other obstructions which have been the cause of the overloading and the distention of the cecum, which produced the incompetency of the valve. Fortunately such cases may be relieved by surgical operation, and it is even possible to repair the valve so as to enable it to resume its function.

“Greedy Colon”

Goodhard, Schmidt, and others hold that abnormal dryness of the feces may be produced by excessive digestion and absorption, leaving so little residue that the bulk of the intestinal contents is too small to stimulate peristaltic action. It is possible that cases of this sort may exist, but it seems more probable that the fault is a too concentrated diet or de-

ficient gastric or intestinal secretion, at least in most of the cases in which this diagnosis has been made. It is much easier to see how the intestine can fail to do its work completely than to understand a condition of excessive activity of digestion.

Excessive Dryness of the Feces

Persons often suffer because of dryness of the stool. This condition may also result from sweating baths and from the drinking of an insufficient amount of fluid, as we have already seen.

Excessive activity of the kidneys, as in *diabetes mellitus* or *diabetes insipidus*, may produce the same result, by depriving the feces of water.

A deficiency of fat in the food leads to constipation in like manner. The presence in the feces of a certain amount of unabsorbed fat is useful not only to prevent excessive dryness, but to prevent too great adhesiveness of the feces and thus to facilitate movement along the colon.

Delay in the Cecum

The cecum is a shallow pocket intended to hold a small amount of liquid for a short time. If the bowels are restrained from normal action by resisting the "call" for evacuation, the cecum becomes filled by the backing up of semi-solid feces, which cause it to sag down, and in time dilate and displace it. The over-filled and heavy cecum drags heavily upon the hepatic flexure, and so narrows the passage along the colon at this point as to produce partial obstruction and delay in the movement of feces from the cecum over into the transverse colon.

Normally, at frequent intervals, the cecum contracts upon its contents, lifting the residues up through the ascending colon and over into the transverse colon. When the cecum is dilated, its ability to push its contents along is greatly lessened, and when it is adherent, this highly important function is lost altogether. The dilated and adherent colon is thus a stagnant cesspool in which food residues and body wastes accumulate and putrefy, being retained in many cases for days and even

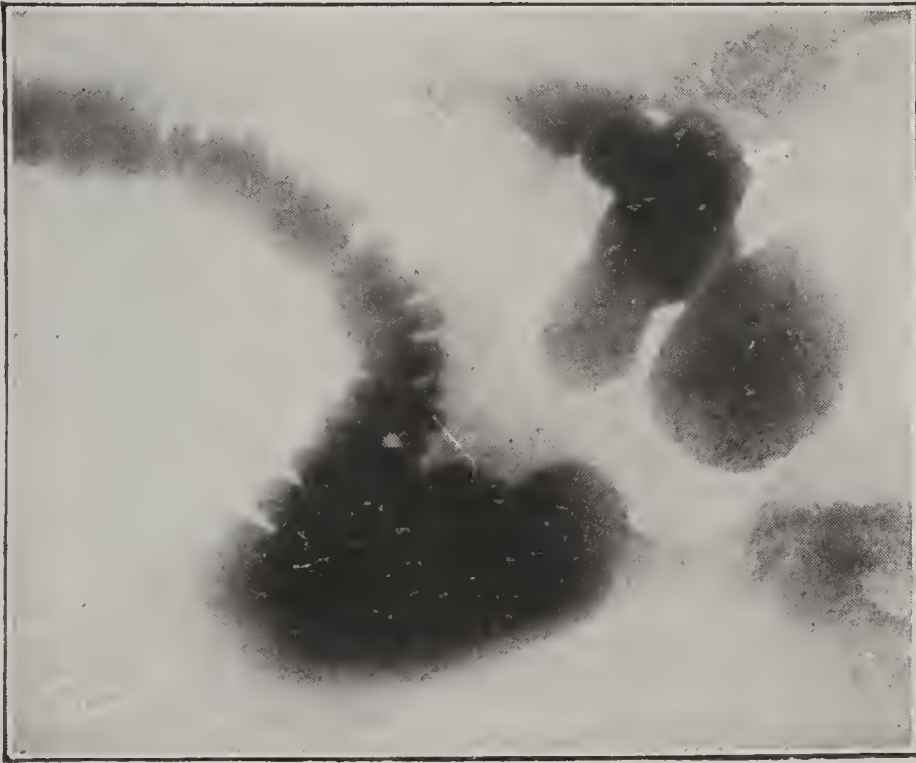
weeks, generating indol, skatol and other poisons, as well as various poisonous gases which distend the bowel and through absorption poison the blood and the tissues. This condition gives rise to the so-called right-sided constipation in which the stools are soft, often liquid and highly putrid, and the bowels move several times daily, as contrasted with the dry and infrequent stools of the more common left-sided constipation.

Delay at the Pelvi-rectal Junction

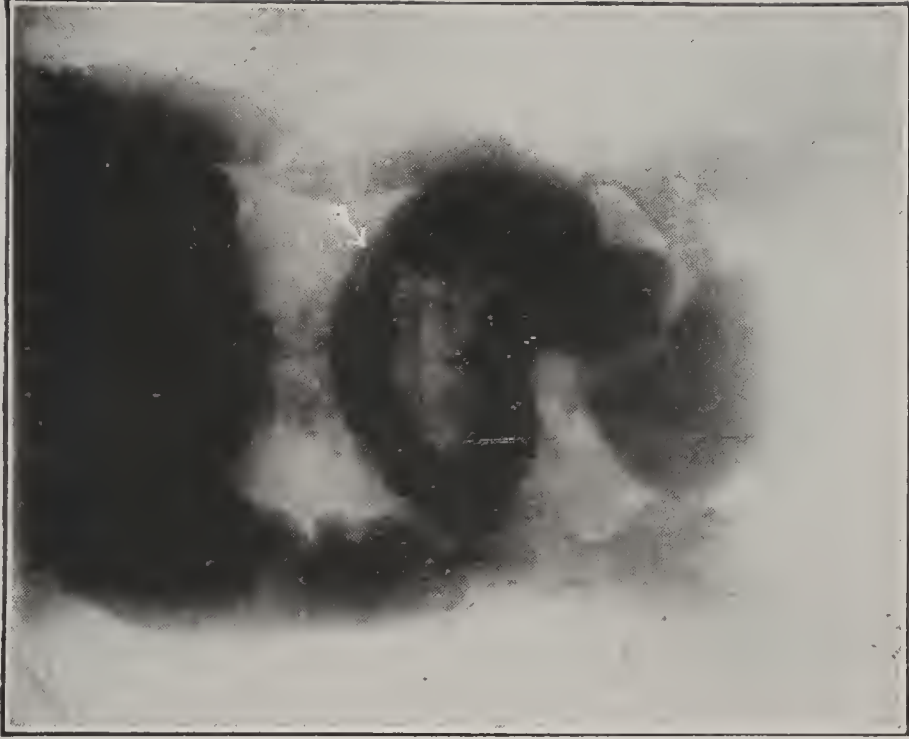
The passage from the colon to the rectum, which is closed and opened by the falling and rising of the pelvic loop of the colon, is sometimes obstructed by thickening due to inflammation or ulceration. Sometimes the pelvic colon becomes adherent to the pelvic floor so that it cannot rise, and there is more or less obstruction to the passage of feces into the rectum. In such a case, there must of necessity be an accumulation of feces in the lower bowel above the rectum, and as a consequence cumulative constipation will be found present.

Fortunately this crippled condition of the

pelvic colon, often the chief obstacle to normal bowel action, may be completely removed by a comparatively simple surgical operation which consists in breaking up the adhesions and suspending the pelvic loop by means of the omentum. This operation has proved completely successful in scores of cases. The accompanying cuts show the appearance of the colon before and after the operation. It should be noted that the bowel is *suspended* by the omentum and is not attached directly to the abdominal wall. The latter operation rarely succeeds and causes so much pain that a second operation to release the bowel is often necessary. In the majority of cases, no operation is required if the patient will change the intestinal flora and keep it changed, although the daily use of the enema may be necessary for some weeks or even months. It is quite possible that absorption of the adhesions may take place in certain cases after the flora has been changed and the colitis cured. Absorption of adhesions, as well as the cure of the colitis always present, is promoted by the persistent use of the hot enema (105° to 112° F.).



Adherent Pelvic Colon



Pelvic Colon Restored to Position
by Operation



Stereoradiograph Showing Incompetency of the Ileocecal Valve, Indicated by the Presence of Bismuth in the Small Intestine after a Bismuth Enema.
(View with Stereoscope)

Thickening of Houston's Valves

It is believed by some surgeons that these membranous valves sometimes become so thickened as to form an obstruction to the passage of feces. The writer has seen no case of this sort, although he has carefully looked for them in hundreds of cases.

Delay at the Outlet

Failure of the anus to relax when the colon contracts interferes seriously with defecation, and may prevent movement of the bowels. This may result from various causes, as a weak stimulus from the defecation center, or unduly contracted anal muscles. This point will be considered further in another connection.

"Lane's Kink"

Within the last dozen years there has been much discussion in medical circles about a "kink" located at the lower end of the small intestine within a few inches of the ileocecal valve. Lane, of London, has attributed to these adhesions of the terminal ileum stasis or stagnation of materials in the ileum, and

most of the disease conditions which develop in the stomach, liver, duodenum, gall-bladder and pancreas.

Recent observations made at the operating table by the writer and others, clearly show, however, that "Lane's Kink" is practically always associated with incompetency of the ileocecal valve. It seems most probable that adhesions of the lower end of the ileum are the result of inflammation caused by the backing up of fecal matters into the small intestine through the open valve. It has also been observed that these "ileal kinks," first mentioned by Lane, are seldom obstructive, the real cause of the delay in the small intestine associated with "kinks" being incompetency of the ileocecal valve, which also is the cause of the "kink."

Mechanical Effects of Constipation

Fecal accumulations in the rectum, and in some cases possibly also accumulations in the pelvic colon and in the cecum, may give rise to various reflex pains on account of pressure. Pain in the buttocks and the back of the thigh, and a dull pain in the region of the

sacrum is often due to the pressure of fecal matters in the rectum. Neuralgia of the testicles and of the ovaries, and dysmenorrhea in young women, is often traceable to this cause. Abnormal sexual excitability, especially during sleep, is also sometimes traceable to accumulations in the rectum. Itching about the anus is often caused by the pressure of a small amount of fecal matter in the anal canal, disappearing at once when the feces are removed. Hemorrhoids may be caused by the pressure of fecal matters upon the hemorrhoidal veins; and varicocele, if not produced, is certainly aggravated by accumulations of fecal matters in the iliac colon.

Headache and sometimes vertigo and a sensation of exhaustion and depression are symptoms commonly experienced by persons suffering from constipation. These symptoms may be the result of reflex action, which seems most probable, or they may be in whole or in part the result of chronic poisoning due to the absorption of long retained fecal matters. The fact that the symptoms disappear almost immediately when the bowel is emptied by an enema, does not necessarily indi-

cate that the act is reflex. Effects due to auto-intoxication are the result of over-saturation of the blood with poisons derived from the bowel contents. When, by removal of the source of the poisons, the intake ceases, the liver and kidneys quickly clear the blood of the subtle intoxicants, and the nerve disturbance ceases.

The Bad Effects of Straining

The violent straining occasioned by the presence of dry and hard feces in the rectum and lower colon is not merely an inconvenience, but often results in serious and sometimes fatal injury.

One of the most common results of straining at stool, especially when prolonged or repeated several times daily, is hemorrhoids, or piles. These are excrescences which form just in the anus, or at its lower edge. The accumulation of fecal matters in the rectum obstructs the flow of blood in the veins which have their origin at this point, and in straining these veins become greatly distended with blood; their walls become thickened, forming irregular masses which are usually forced

out when the bowels move. As the result of the straining, and often as the result of the use of rough toilet paper, the delicate mucous membrane becomes abraded or cracked, infection occurs, and the hemorrhoids become inflamed and swollen. Ulcer or fissure may develop. Thus the hemorrhoids gradually increase in size, until they may become so large that the anal sphincters are overstretched and become relaxed, and in time the rectum may be pushed outside whenever the bowels move. Prolapse of the rectum is most likely to occur in children and emaciated adults.

In persons suffering from arteriosclerosis or degeneration of the blood-vessels, especially aged persons, straining at stool may cause rupture of a blood vessel and sudden death. In angina pectoris a spasm may result from straining at stool, sudden death having been known to occur in cases in which the heart was very feeble. The same should be said with reference to cases of myocarditis. Most smokers over forty have reason for observing this caution.

Stricture

The bowel may be narrowed by the contraction of the scar left behind by a healed ulcer due to tuberculosis, typhoid fever or other cause. When such strictures are present, the peristaltic movements of the intestine are often so strong as to be visible in a thin patient through the abdominal walls. Such cases require operation.

Cancers and Tumors

Cancer of the colon is not infrequent, constituting about 9 per cent of all cancers. Cancer occurs most frequently in the cecum or ascending colon, and next most frequently in the rectum or pelvic colon, points at which the greatest delay of the feces occurs.

Cancer of the colon is not infrequently secondary to cancer in some other location. When cancer exists or has existed in the breast, stomach, or elsewhere, obstinate constipation should lead to a careful physical examination including an X-ray examination of the colon with special reference to the presence of organic obstruction.

Intussusception

Acute obstruction due to "telescoping" of the intestine requires immediate surgical attention.

Chronic constipation is held to be sometimes due to such a telescoping of the pelvic colon into the rectum. This condition is probably quite rare, but it possibly may be more frequent than has been hitherto supposed. Such cases require surgical attention.

Anal Disease

Pain arising from ulcer, fissure, fistula or inflamed hemorrhoids may cause so strong a contraction of the anal sphincters that they fail to relax at the command of the defecation center, so that the bowel must force the feces down through the rectum in opposition to these muscles. This condition exists more frequently than was formerly supposed. Many cases of obstinate constipation have been cured by an operation for removal of painful hemorrhoids or relief of a painful ulcer or fistula.

Obstruction from Pressure

Pregnancy, extreme retroversion of the uterus, an enlarged and painful prostate, malignant or other growths in or about the rectum, and in women, rectocele, from laceration of the perineum, are causes of interference with the proper action of the defecating mechanism.

The usual result of this defective action is to leave a quantity of feces in the rectum or the pelvic colon or in both cavities. The retained feces become dry and hard, sometimes to a surprising degree, and form a mechanical obstruction which results in a damming back of the feces which are left to accumulate in sections of the colon higher up.

Loss of Rectal Reflex

The key to the involuntary part of the act of defecation is the rectal reflex, which is discharged by contact of the feces with the walls of the rectum. Long retention of feces in contact with the rectal nerves destroys their sensibility and so the reflex is lost. This is one of the worst results of the disturbances

in the defecating mechanism, which have been above enumerated. Patients suffering with this form of constipation often report that they have felt no desire for evacuation of the bowels for years. The loss of hearing, or even of the sense of sight, would really be less of a calamity in many cases than the permanent loss of this useful reflex, which is one of the most important protective mechanisms with which the body is provided. Fortunately, however, the reflex generally may be restored.

Disease of the spinal cord may permanently destroy the defecatory center. Constipation is sometimes a most troublesome symptom in locomotor ataxia.

INTESTINAL TOXEMIA OR AUTOINTOXICATION

Bouchard, an eminent French physician, was first to coin the word *autointoxication*, and to point out the various ways in which the disease may be produced by poisons generated in the body. He called special attention to the fact that the intestine, and especially the colon, is a prolific source of poisons. Some of these poisons are excreted by the liver. The bile, as shown by Bouchard, is six times as poisonous as the urine, producing poison enough within ten hours to cause death. The mucous membrane of the intestine has been shown to be a source of poisons which are separated from the blood by the mucous membrane and thrown into the cavity of the intestine to be removed from the body.

Still another source of intestinal poisons is the putrefaction of that portion of the protein of the food which fails to undergo absorption.

The bile, mucus, and other secretions of the intestine and the adjacent glands also un-

dergo putrefaction when conditions are favorable.

This putrefactive process is, as shown by Pasteur, the result of the growth of certain species of bacteria. These putrefactive bacteria are found everywhere. They are present in great numbers wherever putrefaction is taking place. The flesh of every dead animal is filled with teeming millions of these poison-forming microbes within a few hours after death. A piece of flesh taken from an animal just killed, and placed in a tightly sealed glass jar, will be found in a few days in an advanced state of putrefaction. Experiments of this kind were made by Professor Tissier of the famous Pasteur Institute of Paris. He found it impossible to obtain meat so fresh that it did not contain bacteria of different species sufficient to produce complete putrefaction. As ordinarily eaten, the flesh of animals is always in a state of more or less advanced putrefaction, and many millions of living bacteria are found in every morsel. This is true even when the flesh has been cooked; ordinary cooking does not destroy the putrefactive bacteria.

Street dust consists very largely of putrefactive bacteria derived from animal feces which have been dropped in the street and ground into dust by passing vehicles. It is evident then, that the human intestine is very greatly exposed to infection by putrefactive bacteria; and it needs no argument to show that any delay of food residues capable of putrefaction, together with the bile, mucus, and other constituents of the feces, must result in the production of a large amount of intestinal poisons.

In view of these facts, it is safe to say that the worst effects of constipation are those which arise from intestinal autointoxication. Not only Bouchard, but Tissier, Combe, Bourget, Lane of London, and a great number of able medical experts in all parts of the world have within the last few years recognized the great and far-reaching destructive effects of the absorption of bacterial poisons from the intestinal tract. Within the last few years a very great interest has arisen in methods of changing the intestinal flora by dietetic regulation.

Autointoxication without Constipation

It is entirely possible for a person to suffer from intestinal toxemia without constipation, as in cholera morbus, the diarrheas of infancy, chronic diarrhea and colitis; but it is impossible to have constipation without intestinal autointoxication. The fact that the symptoms of toxemia do not occur in every case is no evidence that they are not present. The body must be unduly exposed to toxic influences, even though it may possess to such an extraordinary degree the power to defend itself against these intestinal poisons that immediate visible effects do not appear.

The Intestinal Filter

Says Herter, "In experiments made many years ago with indol, it was found that the epithelium of the digestive tract possesses in a high degree the capacity to bind indol in such a way that this substance cannot be recovered by distillation. I think it likely that in cases where there is excessive production and absorption of indol in the intestinal tract the epithelium acts as a protective agency to the organism as a whole. This action of the

epithelial cells is certainly not confined to indol."

The mucous membrane also affords protection against the penetration of bacteria into the circulation. This is especially true of the mucous membrane of the colon. Bacteria are able to penetrate the walls of the small intestine and of the vermiform appendix much more easily than the walls of the colon. The bacteria also penetrate the mucous membrane of young infants much more readily than that of adults. Ficker found that hunger and exhaustion favor greatly the entrance of bacteria and the development of infection, especially the infection of typhoid fever. Ficker suggested that penetration of the mucous membrane of exhausted animals by bacteria was the cause of the rapid decomposition of the flesh of animals killed when in a state of exhaustion, as in the case of hunted animals which have been driven long distances.

Overeating leads to autointoxication by supplying to the colon an unusual amount of unabsorbed material. The more completely absorption takes place in the small intestine

the less bacterial development in the colon. A cathartic has an effect similar to that of overeating by causing undigested food to enter the colon in considerable quantities. A cathartic which does not move the bowels but only hastens the contents of the small intestine into the colon increases toxemia, causing headache, flatulence and exhaustion. This is particularly true in persons suffering from chronic intestinal autointoxication or so-called biliousness.

Wholesome food, if rich in protein, taken in an unusually large amount, may give rise to a severe attack of intestinal intoxication, indicated by vomiting, diarrhea, headache, coated tongue and depression. The explanation of these cases is to be found in the constant presence in the colon of putrefactive organisms such as Welch's bacillus and *B. putrificus*. So long as the amount of protein in the food is small it is so completely digested and absorbed that the amount which reaches the colon to be acted upon by putrefactive bacteria and converted into toxins is too small to produce any considerable degree of injury; but when the intake of protein is considerably

increased, the quantity of toxins produced is more than the body is able to deal with and toxic effects appear.

According to Herter, Welch's bacillus may be found in the stools of most adult persons (mixed feeders), including many persons who appear to be in perfect health.

When the intestinal mucous membrane is intact, it is able to exclude most of the intestinal poisons, acting like a filter, which permits only the useful substances to enter the blood. The liver, the largest gland in the body, possesses the power to destroy poison to a considerable degree. There are various other organs of the body, such as the glands of internal secretion, of which the thyroid gland is a conspicuous example, which aid in the destruction of poisons. The kidneys both destroy and eliminate poisons, and the skin and the lungs also share in this protective work.

So long as the defensive powers of the body remain intact, enormous quantities of poisons may be produced in the intestine without apparently evil results. This is the reason why many constipated persons seem to suffer no ill effects from intestinal inactivity.

In every case, however, the time comes sooner or later when the intestinal filter no longer acts sufficiently in excluding poisonous matters—when the liver is no longer able to destroy all the poisons brought to the blood; when the thyroid and other glands have become worn out with over-activity; when the kidneys have ceased to be able to maintain the normal degree of blood purity by the excretion of poisons.

When the symptoms of toxemia appear, the fact shows that the poison-destroying mechanism of the body is broken down; the great margin of safety which Nature provides against emergencies, has been used up; the defenses against autotoxins have been swept away, and the tissues are flooded with these subtle and mysterious disease-producing elements.

Bacteria of the Intestine

Roger, the eminent successor of Bouchard, described no less than one hundred sixty different species of bacteria which have been found in the alimentary canal. Many of these produce no poisons. Others produce simple organic acids which are under ordinary cir-

cumstances harmless; still others produce alcohol, formic acid, butyric acid, and other substances which are unquestionably toxic, although not appreciably so in the extremely minute quantities in which they are produced in the intestine under strictly normal conditions. Still other microbes, of which some scores of species are found in the intestine, produce subtle poisons which are capable of causing deadly effects, even in very minute quantities. Everyone is familiar with the unpleasant effects of the volatile substances which emanate from a mass of putrefying flesh. Headache, nausea, and other symptoms may result from the odors alone which arise from putrescent substances. These volatile substances are poisonous, but other non-volatile poisons present are much more active. Some are almost as powerful as the venoms of snakes, which they resemble in chemical composition. The South American Indian poisons the points of his deadly arrows by dipping them into putrid flesh. Butchers as well as undertakers sometimes die as the result of a small cut made with a knife soiled by contact with a dead body. The same poisons are

produced when putrefaction takes place in the intestine.

None of the intestinal microbes are essential for life or health. Pasteur supposed that all life was dependent upon microbes. One of his pupils, Roux, showed this idea to be erroneous, at least as regards vegetables, by causing beans to grow in sterile soil and sterile water. Pasteur admitted his error in regard to vegetable organisms, but still maintained that animals could not live without the aid of intestinal bacteria. Nuttall and Thierfelder, by experiments with guinea pigs, showed that these animals could be brought into the world free from germs, and made to grow on food which contained no trace of bacteria. When the animals were killed, no bacteria were found in their intestines. Recent experiments made by Roux showed that chickens hatched and grown under sterile conditions thrived better than chickens hatched under ordinary conditions.

Numerous other experiments have confirmed this fact, but most important of all were the observations of Levin at Spitzbergen, in the Arctic region. This observer

made careful examination of scores of Arctic animals and found that in the majority of cases no bacteria were present in the intestine. This fact will be easily understood when the additional fact is known that the air, and even sea-water, are in these cold regions practically free from bacteria.

The fact that bacteria are present in the human intestine is therefore no evidence that they supply any human need. The presence of these minute parasites is, instead, an unfortunate incident of our existence. Metchnikoff has shown that colon germs in no way contribute to our well-being, but on the contrary, are an undoubted cause of premature senility, and the unnatural abbreviation of human life, the sad lot of the average man.

The Protective Acid-Forming Bacteria

Professor Tissier, of Paris, well known as one of the leading savants of the renowned Pasteur Institute, many years ago made a profound study of the bacteria of the intestine and established the fact, which had been previously observed by Escherich and others, that the intestine of a new born babe is abso-

lutely free from bacteria. Tissier made an extended research of the manner of the invasion of the intestine of the young child by bacteria. He found that within about seven hours in summer time, and twenty hours in winter time, when bacteria are less abundant in the air, the intestine of the recently born child is found to be swarming with bacteria, many of which are of the putrefactive sort. Within a few days, however, the putrefactive bacteria disappear, and a peculiarly shaped acid-forming microbe, to which Professor Tissier gave the name *bacillus bifidus*, takes their place.

This observation was of the greatest importance. It reveals the beneficent plan of Nature, by which the young infant is protected from the deadly effects of putrefactive organisms. So long as the *bacillus bifidus* continues to hold its place as the dominant microbe of the child's intestine, the stools are slightly acid and the little one enjoys perfect health. The child's intestine may be compared to a flower garden which is so completely occupied by flowers that there is no room for the growth of noxious weeds.

As the child becomes older, and is fed upon cow's milk, meat, and other foodstuffs which contain putrefactive organisms, and is no longer nursed at the breast, the bacillus bifidus becomes less prominent in the stools, putrefactive bacteria make their appearance, the child becomes subject to constipation and diarrheas, and the troubles of life begin. The stools, instead of being acid, acquire a foul odor. In many instances, such symptoms of chronic autointoxication as rickets, scurvy, arrested growth, emaciation, decay of the teeth, nasal catarrh, and other evidences of physical weakness make their appearance.

Infantile convulsions, night terrors, grinding the teeth during sleep, fitfulness, feverishness, and numerous other symptoms of nervous disturbance in infants, are directly due to poisoning as the result of constipation, with intestinal putrefaction. So long as the stool remains normally acid, constipation does not occur, but when putrefaction and foul-smelling feces occur then constipation appears with a great variety of nervous and other symptoms which are a natural consequence.

Changing the Flora with *B. Acidophilus*

In 1900, Moro discovered in infants' stools the *B. acidophilus*, an acid-forming organism. Dr. Tissier found in Bulgarian buttermilk a germ which seemed to be identical with the acid-forming organism found in the human intestine. Metchnikoff proclaimed the Bulgarian germ as a panacea for colon troubles and the various maladies which result from autointoxication. It is now known that the Bulgarian germ has little or no value as a means of combating intestinal toxemia for the reason that it is not a native of the colon and will not live and grow in the human colon as the *B. acidophilus* will do. It is not really necessary, however, to implant the *B. acidophilus*; as small numbers are always present in the colon and by the free administration of special carbohydrates may be made to develop such a luxuriant growth that the pernicious organisms will be crowded out. This is called "changing the flora." For many years, Metchnikoff sought to accomplish this, but failed. Fortunately, we are now able to change the flora with prompt certitude by proper feeding.

Old Age Due to Colon Poisons

Professor Metchnikoff announced the theory that old age, as well as many common chronic disorders, is due to poisons absorbed from the intestines. These poisons are formed by certain germs known as anærobes. Some of these germs are found in such great quantities in butcher's meat that Herter has given to them the name "meat bacteria." By the use of meat these germs are introduced into the intestine in great numbers. The poisons formed by these germs are extremely virulent, and when taken into the body, gradually break down the liver, kidneys, and other defensive organs, and so give rise to a large number of very common and very serious diseases. The chronic poisoning first makes its appearance in acute attacks, such as sick headache, nervous headache, loss of appetite, coated tongue, bilious attacks, irregular action of the bowels, diarrhea, appendicitis, febrile attacks resembling malaria, and insomnia.

Many Diseases Caused by Colon Poisons

As the system becomes more and more saturated with these poisons through the gradual failure of the liver and kidneys and the constant multiplication of the bacteria, other more chronic symptoms appear, such as constant headache, mental confusion, neurasthenia, nervous exhaustion, gall-stones, hemorrhoids, emaciation, browning of the skin, particularly about the eyes, various skin diseases, especially acne, eczema, psoriasis and urticaria, neuralgia, pain and stiffness of the joints. After a time still worse conditions make their appearance, such as Bright's disease, sclerosis or hardening of the liver, dropsy, chronic rheumatism, and rheumatic gout.

Chronic autointoxication is unquestionably a factor in nearly all chronic disorders, and lays the foundation for tuberculosis, cancer of the stomach, ulcer of the stomach, and other gastric disorders. Many women supposed to be suffering from disorders peculiar to their sex, are really suffering only from autointoxication, which is the natural

result of prolapse of the viscera, colitis, and inattention to the hygiene of the bowels.

It has long been known that the conditions above mentioned may be greatly relieved by the use of buttermilk and kumyss, but these remedies have never gained very great confidence for the reason that, while they have seemed to succeed remarkably in certain cases, in the majority of cases the relief obtained has been very temporary, and often their use has been attended by complete failure. The reason for this was the fact that the lactic ferment of kumyss and buttermilk is not able to live in the large intestine. This is the particular part of the alimentary canal in which the poison-forming anærobes are found in largest numbers, especially in the cecum. All foodstuffs are capable of undergoing destructive change as the result of the action of germs upon them. Starches, dex- trines, and sugars (carbohydrates) ferment, while proteins putrefy. The products of the fermentation of carbohydrates are acids that are harmless in the quantities in which they are produced in the body. The products of putrefaction are ptomaines, ammo-

nia, and toxins, all poisonous substances. Some of the ptomaines and toxins are closely akin to the venoms of poisonous serpents, and, like them, are very active even in very small quantities.

The Effects of Constipation or Stasis

When there is delay in the movement of foodstuffs along the digestive tract, fermentations or putrefactions quickly begin. The immediate result will be the formation of odorless gases in the intestines, with sour-smelling stools, if starch or sugar is present in sufficient amount to give rise to fermentation. If protein and fats are present in large amount, then the result of delay will be putrefaction and the formation of foul-smelling gases and putrid stools. An infusion from a putrid stool, seething with the putrefaction of undigested remnants of protein foodstuffs such as beefsteak, mutton chops, pork, etc., will kill an animal very quickly. Such a stool is swarming with deadly bacteria, and is saturated with their poisons. Very often these putrid masses have remained in the body for many hours or even days, during

which time the absorbents of the intestine are constantly sucking up the poisons and distributing them throughout the body, so that every cell and tissue is bathed with them.

At first the evil effects of this systematic poisoning do not appear. Indeed, many years may elapse before serious consequences make their appearance. The reason for this is that the body is provided with means of defence. The mucous membrane acts as a filter to exclude poisons. The liver destroys poisons. The thyroid gland, the suprarenal capsules, and probably the spleen and several organs, aid in the destruction of poisons. The suprarenal glands are believed to be especially active in destroying the poisonous pigments which are produced by putrefaction in the intestine. After a longer or shorter time these defenses break down. The mucous membrane becomes the seat of infection,—colitis,—and allows a much larger quantity of poisons to pass into the blood stream. The liver, thyroid, and other poison-destroying organs become damaged by overwork, and fail to keep the blood clear of poisons. The kidneys are enormously overworked in their efforts

to remove these deadly poisons from the blood, and so lose their efficiency. Now the effects of chronic poisoning begin to make their appearance. Every organ and every function of the body shows evidence of damage. The poisons circulating in the blood irritate the walls of the blood vessels and cause first contraction, then hardening and degeneration, or arteriosclerosis. The brain and nerves show evidences of depression or irritation, according to the nature of the dominating poisons. Headaches, neuralgia, neuritis, paralysis, mental dullness, neurasthenia, even insanity, are the results. Diseases of the liver, thyroid gland and spleen develop. Skin diseases of various kinds and every sort of bodily derangement, are seen.

Intestinal Gas

Numerous observations by Herter and his assistants clearly showed that intestinal gas is chiefly due to the activity of the colon bacillus and Welch's bacillus. Excessive production of foul smelling gas may generally be taken as an indication of the presence of Welch's bacillus in great numbers. The

colon bacillus also produces gas but in less quantities.

The Absorption of Bacteria

It is now known that millions of bacteria are absorbed daily from the colon. When colitis is present the bacteria more readily find entrance to the circulation. Experiments on rabbits have shown that when colon bacilli are injected into the blood vessels at frequent intervals during a period of several weeks very pronounced changes take place in the liver, kidneys and other vital organs. These changes consist in the increase of connective tissue, which results in fibroid degeneration. It was pointed out some years ago by Professor Adami that bacteria are constantly to be found in the liver and kidneys and other vital organs to which they are carried by the blood stream. They are also carried by leucocytes or white blood cells which swallow them and transport them to distant parts of the body. Some of the bacteria swallowed by the white cells are destroyed but many remain alive and even continue to grow.

It has been demonstrated that gallstones

are one of the consequences of bacterial infection. One of the functions of the liver is to remove bacteria from the blood, sending it out with the bile. In this way the gallbladder often becomes infected, cholesterin is separated from the blood and gallstones are formed. It is known that cholesterin is present in excessive quantity in meat eaters. Meat eating also infects the intestine and encourages the growth of putrefactive bacteria.

Immunity to Intestinal Bacteria

Kidd, an English surgeon, maintains that absorption of bacteria is constantly taking place and on such an extensive scale that the body may be properly called a bacterial sponge. The absorption takes place not only from diseased teeth and other infected foci but especially from the intestine. The only reason these bacteria with which we live continually in close contact do not destroy us is that an immunity is developed by the constant absorption of small numbers of germs. When the number of germs absorbed is considerably larger than usual, which frequently occurs, the result is a noticeable disturbance

which may be manifested by depression and a feeling of being out of sorts; or in case the absorption is large, a chill with a slight rise of temperature. The influx of unusual quantities of bacteria may give rise to neuralgic pains, commonly termed neuritis, or to pains in the muscles or joints usually designated as rheumatism. When the invading germs colonize in some particular organ, the result may be a cystitis or infection of the bladder, pyelitis, an inflammation of the gallbladder, a duodenal ulcer, an inflammation of the prostate or of the kidney and various other local infections. Orth and others have shown that pernicious organisms may penetrate the mucous membrane of the intestine and enter the lymphatic channels and thus find their way into the circulation. The spread of bacteria in the body, in fact, seems to be chiefly through the lymphatics rather than through the blood vessels.

Danysz has presented a great amount of evidence in support of the view that many common cutaneous maladies are due to anaphylaxis caused by bacterial poisons developed in the intestine to which the body has

been sensitized. He claims to have cured many cases of rheumatism, eczema, asthma, urticaria and other disorders by the use of vaccines prepared from intestinal toxins.

The writer has encountered many cases in which the views of Danysz were fully confirmed both by the clinical findings and the results of treatment. It should be said, however, that the real cure is to be found, not in vaccination, but in a thoroughgoing change of the intestinal flora.

Universal Toxemia

In civilized countries so many errors in diet are cultivated through ignorance or false conceptions of food values and the colon is so universally abused or neglected that chronic autointoxication, or intestinal toxemia, has come to be a practically universal condition. Dr. Bryce, of Birmingham, a well-known physician and medical author, recognizing this fact says,

“We lavish money on our houses to secure perfect drainage for them, but we fail to secure it for ourselves. If the main drainage system of any house leaks, saturating the sub-

soil with sewage matter, we soon put ourselves in communication with the sanitary authorities. Yet we permit the main excretory system of our bodies to harbour foul, stinking, and putrefying substances, which overflow into all our tissues, flooding them with living, disease-producing germs, and are surprised and often aggrieved because we are stricken down with illness.

“For that is the effect of chronic intestinal stasis, and it is perfectly clear, by Dr. Kellogg’s standard of intestinal activity (three evacuations daily), that we are all victims of colonic stagnation. This means that there is an excess of toxic material in the small intestine, with absorption into the circulation of a greater quantity of poisonous products than can be converted into harmless substances and excreted by the organs of defence.”

Colon Poisons and Fatigue

Sir Lauder Brunton long ago called attention to the colon as a source of fatigue poisons, an observation which has since been abundantly confirmed by many investigators. This fact readily accounts for the atrophy,

depression, mental confusion, mental dulness and moral perversion which is observed in these cases. It must be remembered, also, that the colon is the source of a great variety of poisons, each producing its own specific effects, so that a great number of the symptoms observed in the various forms of acute and chronic mental disease may be easily accounted for.

Herter observed that the administration of indol by the stomach was followed by a pronounced sense of muscular fatigue. He also observed that persons showing much indican in the urine often suffered greatly from a sense of exhaustion. At the request of Herter, Professor Lee, of Columbia University, made experiments upon various animals to test the effects of indol upon muscle fatigue. He found the effect to be very pronounced, especially in the case of a warm blooded animal, the cat, in which a solution of indol 1 part to 25,000 reduced the amount of work done in the ratio of 100 to 37.

Anything which tends to develop a state of acidosis by diminishing the alkalinity of the blood and body fluids at once becomes a

cause of exhaustion or fatigue. Constipated persons are always lacking in endurance. The chronic sufferers from constipation, colitis and autointoxication are notably lacking in stamina.

All carnivorous animals suffer from auto-intoxication, and for this reason usually lack the endurance possessed in so remarkable a degree by vegetable feeding animals. Roosevelt noted that a horse with a heavy man on his back was able to run down a lion in a mile and a half. Flesh abstaining athletes are invariably the winners in endurance contests.

VEGETABLES

Grains
per ounce

Dried Beans	40.	<input type="text"/>
Dried Peas	28.5	<input type="text"/>
Lentils	20.	<input type="text"/>
Green Peas	9.35	<input type="text"/>
Cabbage	9.2	<input type="text"/>
Parsnip	8.65	<input type="text"/>
Brussels Sprouts	7.85	<input type="text"/>
Kohlrabi	7.75	<input type="text"/>
Celery	7.	<input type="text"/>
Turnip	6.6	<input type="text"/>
Pumpkin	6.1	<input type="text"/>
B. Potato	5.45	<input type="text"/>
Beets	5.25	<input type="text"/>
Asparagus	5.2	<input type="text"/>
Carrots	4.9	<input type="text"/>
Spinach	4.65	<input type="text"/>
Cauliflower	4.55	<input type="text"/>
Tomatoes	4.26	<input type="text"/>
Green Peas	4.	<input type="text"/>
Cucumber	3.9	<input type="text"/>
Lettuce	3.65	<input type="text"/>
Onion	3.55	<input type="text"/>

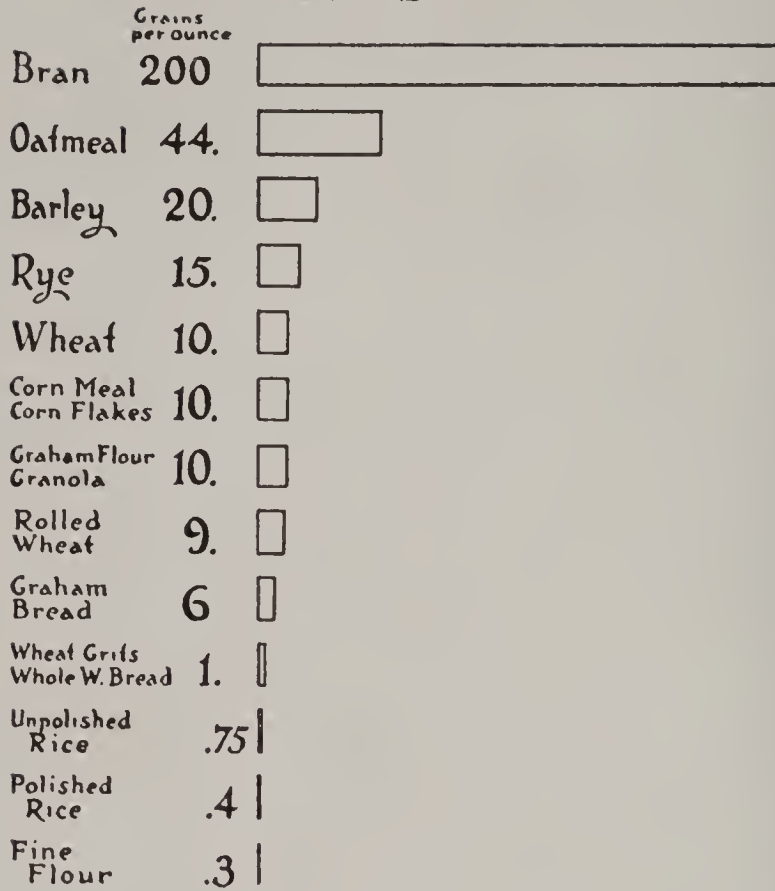
FRUITS

Grains
per ounce

Huckleberries	61.5	<input type="text"/>
Red Raspberries	37.	<input type="text"/>
Blackberries	25.	<input type="text"/>
Cranberries	25.	<input type="text"/>
Currants	23.	<input type="text"/>
Figs	22.5	<input type="text"/>
Goosberries	17.5	<input type="text"/>
Pears	15.	<input type="text"/>
Apricots	12.5	<input type="text"/>
Prunes	10.	<input type="text"/>
Cherries	10.	<input type="text"/>
Strawberries	10.	<input type="text"/>
Oranges	10.	<input type="text"/>
Plums	7.5	<input type="text"/>
Grapes	7.5	<input type="text"/>
Raisins	7.5	<input type="text"/>
Stewed Raisins	7.4	<input type="text"/>
Peaches	5.	<input type="text"/>
Apples	5.	<input type="text"/>
Bananas	.3	<input type="text"/>

Chart Showing Proportion of Cellulose in Some of the Common Vegetables and Fruits—Also Grains of Cellulose per Ounce

CEREALS



DIETS

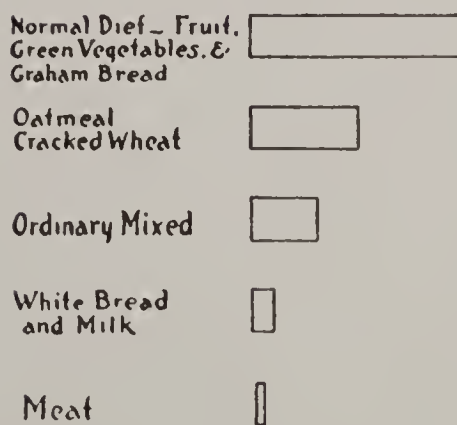


Chart Showing Proportion of Cellulose in Some of the Common
Cereal Foods—Also Grains of Cellulose per Ounce.

IMPORTANT DISCUSSION OF ALIMENTARY TOXEMIA BY THE ROYAL SOCIETY OF MEDICINE OF GREAT BRITAIN

About two years ago the subject of alimentary toxemia was discussed in London by the Royal Society of Medicine, fifty-seven of the leading physicians of Great Britain participating. Among the speakers were eminent surgeons, physicians, and specialists in the various branches of medicine.

Poisons of Alimentary Intestinal Toxemia

The following is a list of the various poisons noted by the several speakers: Indol, skatol, phenol, cresol, indican, sulphuretted hydrogen, ammonia, histidin, urobilin, methylmercaptan, tetramethylendiamin, pentamethylendiamin, putrescin, cadaverin, lecithin, neurin, cholin, muscarin, butyric acid, beta-imidazolethylamin, methylguadinin, ptomatropin, botulin, mytilotoxin, mytilocongestin, oxybetain, tyramin, agmatin,

tryptophan, sepsin, indolethylamin, sulphemoglobin.

Of the thirty-six poisons mentioned above, several are highly active, producing most profound effects, and in very small quantities. In cases of alimentary toxemia some one or several of these poisons are constantly bathing the delicate body cells, and setting up changes which finally result in grave disease.

It should be understood that these findings are not mere theories, but are the results of demonstration in actual practice by eminent physicians. Of course it is not claimed that alimentary toxemia is the only cause of all the symptoms and diseases named: although of many it may be the sole or principal cause, some are due to other causes as well.

In the following summary the various symptoms and disorders mentioned in the discussion by the different speakers, are grouped under appropriate headings:—

The Digestive Organs

Duodenal ulcer causing partial or complete obstruction of the duodenum; pyloric spasm; pyloric obstruction; distension and



Radiogram of Gall Stones



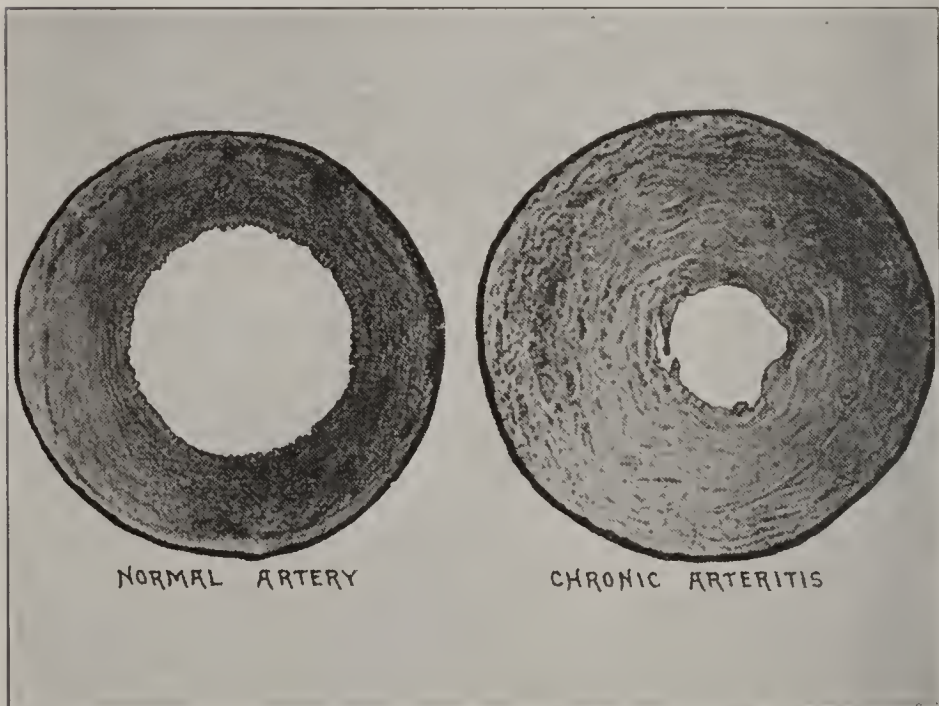
Ulcer of the Stomach



Cirrhosis of the Liver



Diseased Arteries



Sectional View of Arteries Showing Effects of Arteriosclerosis

dilation of the stomach; gastric ulcer; cancer of the stomach; adhesions of the omentum to the stomach and liver; inflammation of the liver; cancer of the liver.

The muscular wall of the intestine as well as other muscles atrophies, so that the passage of their contents is hindered. The abdominal viscera lose their normal relationship to the spine and to each other, on account of weakening of the abdominal muscles; these displacements are much more marked and serious in women. Other conditions are: catarrh of the intestines; foul gases and foul-smelling stools; colitis; acute enteritis; appendicitis, acute and chronic; adhesions and "kinks" of the intestine; visceroptosis; enlargement of spleen; distended abdomen; tenderness of the abdomen; summer diarrhea of children; inflammation of pancreas; chronic dragging abdominal pains; gastritis; cancer of pancreas; inflammatory changes of gall-bladder; gallstones; cancer of gall-bladder; degeneration of liver; cirrhosis of liver; infection of the gums, and decay of the teeth; ulcers in the mouth and pharynx.

Heart and Blood-Vessels

The following conditions were named by various speakers as due to intestinal toxemia:

Wasting and weakening of the heart muscle; microbic cyanosis from breaking up of blood cells; fatty degeneration of the heart; endocarditis; myocarditis; subnormal blood pressure; enlargement of the heart; dilatation of the aorta; high blood pressure; arteriosclerosis; permanent dilatation of arteries.

Dr. W. Bezley says: "There are few phases of cardiovascular trouble (disease of heart and blood vessels) with which disorder of some part of the alimentary tract is not causatively associated."

The Nervous System

Profound disturbances of the nervous system are shown by various headaches—frontal, occipital, temporal, dull or intense, hemicrania; headache of a character to lead to a mistaken diagnosis of brain tumor. Dr. Lane tells of a case where a surgeon had proposed an operation for the removal of a tumor from the frontal lobe of the brain; the difficulty was

wholly removed by the exclusion of the colon. Acute neuralgic pains in the legs; neuritis; twitching of the eyes and of muscles of face, arms, legs, etc. Lassitude; irritability; disturbances of nervous system, varying from simple headaches to absolute collapse; mental and physical depression. "A medical man with neurasthenic symptoms and a belief that he was ruined, recovered after he left off taking an egg for breakfast." Insomnia; troubled sleep, unpleasant dreams; unrefreshing sleep, the patient awakening tired; excessive drowsiness; shivery sensations across lower back; burning sensations in face, hands, etc.; epileptiform tic; typhoid state; paralysis; chronic fatigue; horror of noises; morbid introspection; perverted moral feelings; melancholia, mania, loss of memory; difficulty of mental concentration; imbecility; insanity; delirium, coma.

The Eyes

Show degenerative changes; inflammation of the lens; inflammation of the optic nerve; hardening of the lens; scleritis, sclerokeratitis; iritis; iridocyclitis; cataract;

recurrent hemorrhage in the retina; eyes dull and heavy. W. Long says: "As an ophthalmic surgeon, I can look forward full of hope to a future when those serious eye affections will cease to occur, because the physician has taught mothers how to feed children properly, and the dental surgeon has impressed upon the population at large the importance of proper mastication and the hygiene of the mouth."

The Skin

Among the skin symptoms noted by various experts may be mentioned the following:—

Formation of wrinkles; thin, inelastic, starchy skin; pigmentation of the skin—yellow, brown, slate-black, blue; muddy complexion; offensive secretion from skin flexures; thickening of the skin of the back of the upper arm; irritability of the skin; sweating of the palms of the hands and the soles of the feet; eruptions of the skin—sores and boils; pemphigus; pruritis; herpes; eczema; dermatitis; lupus erythematosus; acne rosacea; cold, clammy extremities; dark circles under the eyes; seborrhea; psoriasis; pityriasis; alopecia; lichen; planus; jaun-

dice. "An infinitesimal amount of poison may suffice to cause skin eruption."

Muscles and Joints

Degeneration of the muscles; "Muscles waste and become soft and in advanced cases tear easily." "In young life the muscular debility produces the deformities which are called dorsal excurvation, or round shoulders, lateral curvature, flat-foot, and knock-knee." "Weakness of abdominal muscles causes accumulation of feces in the pelvic colon, which renders evacuation of contents more and more difficult." Prominence of bones; rheumatic pains simulating sciatica and lumbago; various muscular pains; muscular rheumatism; arthritis deformans; synovitis; rickets; arthritis, acute and chronic. Tubercle, and rheumatoid arthritis are the direct result of intestinal intoxication. Dr. Lane says: "I do not believe it is possible for either of these diseases to obtain a foothold except in the presence of stasis."

Genito-Urinary and Reproductive Organs

Intestinal toxemia appears as a very active cause of disorders of the genito-urinary organs, among which are mentioned the following:—

Various displacements, distortions and diseases of the uterus; change in the whole form and contour of woman; fibrosis of breast; wasting of breasts; induration of breasts; sub-acute and chronic mastitis; cancer of breast; metritis and endometritis; infection of bladder especially in women; frequent urination; albumosuria; acute nephritis, movable kidney; floating kidney. Dr. Lane goes so far as to say: "Autointoxication plays so large a part in the development of diseases of the female genito-urinary apparatus, that they may be regarded by the gynecologist as a product of intestinal stasis."

General Disorders and Disturbances of Nutrition

In this class of disorders are named:—

Degeneration of the organs of elimination, especially the liver, kidneys (Bright's dis-

case) and spleen; pernicious anemia; lowered resistance to infection of all kinds; premature senile decay; retardation of growth in children, accompanied by mental irritability and muscular fatigue; adenoids; enlarged tonsils; scurvy; enlarged thyroid (goiter); various tumors of thyroid; Raynaud's disease.

In those who apparently suffer no harm from constipation during a long series of years there is perhaps, as suggested by Hurst, a partial immunity established. The writer has long believed that such an immunity is sometimes established in the very obstinate constipation which accompanies absolute fasting, because of the cleansing of the tongue and reappearance of appetite which often occurs at the end of the second or third week of the fast, a phenomenon very like that which appears in typhoid fever and other continued fevers. It must not be supposed, however, that even the establishment of so-called immunity insures the body against all injury. The labor of eliminating an enormous amount of virulent toxins, which falls upon the kidneys, damages the renal tissues

and produces premature failure of these essential organs. Any process which develops toxins within the body is a menace to the life of the tissues and should be suppressed as far as possible, and as quickly as possible.

The fact that symptoms of poisoning resulting from constipation do not appear at once is no evidence that injury is not done. Dr. William Hunter in the course of the London discussion remarked that the fact that chronic constipation "might exist in certain individuals as an almost permanent condition without apparently causing ill-health is due solely to the protective power and action of the liver. It is not any evidence of the comparative harmlessness of constipation *per se*, but only an evidence that some individuals possess the cecum and the colon of an ox, with the liver of a pig, capable of doing any amount of distoxication."

In the face of such an array of evidence backed up by the authority of nearly sixty eminent English physicians—and many hundreds of other English, German, and French physicians whose names might be added—it is no longer possible to ignore the importance of

alimentary toxemia or autointoxication as a factor in the production of disease. To no other single cause is it possible to attribute one-tenth as many various and widely diverse disorders. It may be said that almost every chronic disease known is directly or indirectly due to the influence of bacterial poisons absorbed from the intestine. The colon may be justly looked upon as a veritable Pandora's box, out of which come more human misery and suffering, mental and moral as well as physical, than from any other known source.

The successful treatment of alimentary toxemia often taxes to the utmost the resources of the best equipped physician. Sometimes it is necessary to call in the services of the surgeon.

It may be fairly said, however, that at least nine-tenths of the possible benefits to be derived from treatment is to be secured by combating intestinal stagnation. By such regulation of diet and habits as to secure a thorough evacuation of the bowels at least three times a day, or after each meal, and by excluding from the diet flesh meats and other putrescible substances, more can be accom-

plished toward eliminating from the intestine pernicious parasitic organisms and the multitudinous poisons which they produce than by all other means.

The sources of the poison-forming bacteria which grow in the human intestine are numerous. It is probable, however, that butcher's meat, fish, oysters and other shellfish are the chief sources, for Tissier found that when he obtained flesh from the slaughterhouse in as fresh a condition as possible, it contained all the bacteria necessary to produce active putrefaction, which was made evident to the sense of smell within twenty-four hours, and became more and more pronounced from day to day.

Bacteriologists have shown that the mouth always contains putrefactive bacteria. The normal stomach is sterile during digestion, because the gastric juice is a powerful germicide and destroys them; but in stomachs which do not produce a sufficient amount of gastric juice, and in normal stomachs when empty of food, great numbers of these dangerous microbes may be found.

Below the stomach the number of bacteria

increase. At the lower end of the small intestine, and in the cecum, the number of living bacteria is the greatest.

The reason for this is the presence of food residues and body wastes of character suitable to encourage growth of putrefactive bacteria, while starch and sugar which are needed for the growth of acid-forming organisms are absent, having been digested and absorbed in the small intestine.

Observations of Herter and Others on the Intestinal Flora and Autointoxication

In examination of the stools of very young infants, Herter found that *B. bifidus*, an acidophile organism, was always present in the meconium, which thus serves as a protection against the entrance of putrefactive bacteria.

The same acute observer noted that the stools of a healthy nursing infant may be placed in a closed test tube in an incubator for several weeks without the development of putrefaction, and this is true even when the material has been inoculated with highly putrefactive organisms such as *B. putrificus*.

He also observed that in cases of children

subject to pronounced intestinal putrefaction there is a retardation of growth with abdominal distention and poisoning of the muscular system, shown by signs of weariness and slowness in learning to walk.

Different Types of Intestinal Autointoxication (Herter)

1. *The indolic type* associated with a large amount of indican in the urine. In these cases there is stasis in the small intestine and incompetency of the ileocecal valve. The indican is produced by colon bacilli and *B. putrificus*, the colon bacillus acting upon partially digested proteins and the putrificus upon the proteins which have escaped digestion and absorption. These patients suffer from headaches. There is usually marked dilatation of the cecum, often with adhesions of the cecum or the appendix. In many cases operations for removal of the appendix have been performed without benefit. The bowel movements are often loose and frequent. Patients not infrequently have regular daily stools quite putrid in odor.

2. *The butyric type.* The stools have a

very strong rancid odor of butyric acid. Bacteriological examination shows the dominance of Welch's bacillus. *B. putrificus* is also often present. The reaction of the stool may be acid, due to the large amount of butyric acid, and indol may be wholly absent; hence indican will not appear in the urine in any quantity.

The feces in cases of butyric acid intoxication often contain a hemolytic substance, that is, a substance which is capable of causing disintegration of the blood cells. It was held by Herter that this might be an efficient cause of anemia. The anemia produced in these cases is of the secondary type, the coloring matter being reduced more than the red cell count.

Experiments (Herter) have shown that the Welch's bacillus produces substances capable of destroying the red blood cells. In these cases the total number of blood cells is reduced. Later the hemoglobin is reduced in greater proportion than the number of red cells. Patients show evidences of premature senility such as brown spots upon the hands and face, general pigmentation of the skin,

loss of suppleness of the skin, wrinkling of the skin of the face and hands.

The butyric acid type of intoxication is very commonly associated with colitis. The stools show an abundance of thick, opaque mucus, frequently in the form of flakes or casts and not infrequently mixed with pus.

3. A combination of the two classes described, that is, of the indolic and butyric acid types of intestinal intoxication constitutes the third class, which is the most severe of all forms of intestinal toxemia. These patients have usually suffered for many years and have frequently depended for years upon mineral waters and other laxatives of various sorts for bowel movements. They are considerably depreciated physically; often greatly depressed mentally; not infrequently develop manic depressive insanity with suicidal tendencies. Many of these patients are classed as neurasthenics. Not a few find refuge in asylums for the insane. Not a small percentage of these cases drift into drug habits as the result of extreme nervous depression, toxic neuralgia, insomnia and other miseries which their depreciated morale ren-

ders them unable to endure. It is quite probable that not a few cases of pernicious anemia have their beginning in this type of intestinal autointoxication. This was the view of Herter, and his observations are clearly supported by those of the writer as well as many others.

Herter pointed out so long ago as 1907 (The Common Bacterial Infections of the Digestive Tract) that the *B. acidophilus* combats putrefaction through its "ability to grow in a more strongly acid medium than can be withstood by meat bacteria." Herter also mentioned that "if large numbers of these bacteria be administered to a dog by mouth, other flora may be temporarily suppressed to a large extent. But as in the case of feeding other kinds of microorganisms the leading part can only be maintained by continuously feeding large numbers of the acidophiles." Herter thus anticipated the later work of Rettger and others, although the latter greatly extended the original observations of Herter and showed their practical bearing on therapeutics.

Intestinal Toxemia a Cause of Senility

Herter observed that "the onset of senility may be distinctly accelerated through the development of intestinal infections in which the putrefactive anaerobes are prominently represented." He says, "I have observed this in cases where it has appeared to me a certainty that other toxic causes of premature senility could be excluded. It is probable that the 'wild races' of bacteria of which he (Metchnikoff) speaks as responsible for senile changes consist largely of putrefactive microörganisms. I am inclined to give prominence to *B. aerogenes capsulatus* (Welch's bacillus) as the most important factor in the production of the putrefactive decompositions of advanced age."

Herter fed a cat on raw meat and found the entire intestinal tract infected by the Welch's bacillus in great numbers. Examination of the stools of lions, tigers, wolves and dogs and other carnivorous animals showed pronounced infection with the Welch's bacillus. A guinea-pig inoculated with the feces of these animals died in 15 to 18 hours. Ex-

amination of the stools of the buffalo, goat, camel, elephant, and horse showed Welch's bacillus only in the case of the buffalo, in the stools of which a few Welch's bacilli were found.

Welch's Bacillus Sometimes Gives Rise to Diarrhea

Herter has shown that the living cells of the body, especially the liver, kidneys, muscles and the mucous membrane of the intestinal tract, have the power to absorb considerable quantities of indol and phenol, holding them so firmly that they cannot be recovered by distillation. This function is of great importance for the reason that even minute quantities of indol or phenol in the blood produce great nervous disturbances. In some animals the liver is less active than usual in removing indol from the blood and holding it. In such cases indol produces highly disturbing effects upon the nervous system.

Drs. Richard and Howland demonstrated the highly toxic effects of indol by first sensitizing animals or lowering their resistance by the injection of minute quantities of po-

potassium cyanide, the amount of cyanide injected being so small as to produce no noticeable effect. In animals so prepared indol was found to produce highly toxic effects in minute doses. 0.0003 grams of indol per gram of body weight injected into a guinea-pig produced characteristic twitchings in 8 minutes, the attack lasting 97 minutes. The same quantity of indol was then injected into another guinea-pig which had previously received 0.005 milligrams of potassium cyanide per gram of body weight. The twitching began in 2 minutes, was much more violent, and lasted 5 hours.

Mental Disease from Intestinal Toxemia

For many years experts in mental disease, both in this country and in Europe, have maintained that certain forms of insanity, particularly dementia praecox and manic depressive insanity, are due to functional disturbances or structural degenerations set up by toxins derived from focal infections, the seat of which may be the tonsils, the teeth, the genital organs or even the gallbladder or the appendix, but which is most frequently

found to be the colon. In many cases at least, and probably in a very large proportion of all cases, infections of the tonsils, teeth and other so-called focal infections, are really the result of the lowered vital resistance produced by long-continued absorption of poisons from the colon.

Cotton and others have in recent years insisted upon the great importance of the colon as a factor in mental disease. These authorities cite many cases in which removal of the colon or a large part of it has resulted in restoration of the patient to mental soundness when other means had failed. The writer is of the opinion that in these cases a change of the intestinal flora by the methods pointed out and careful attention to colon hygiene would have accomplished the same results. The colon itself is not the offender. The source of the trouble is the contents of the colon. Stasis is of course a factor; but when putrefaction is suppressed, the colon contents are no longer toxic, and stasis, even reflux, is a matter of less moment. In fact, cases are exceedingly rare in which a thorough-going change of the intestinal flora

does not result in restoring normal colon activity. The only exceptions should be found in cases of mechanical obstruction.

Epilepsy and Colon Poisons

Epilepsy is another disease which in many cases may be traced to intestinal poisons. The presence in the urine of epileptics, in large quantities, of poisons capable of producing convulsions was pointed out many years ago by Bouchard and his students. Later Herter observed unmistakable evidence of excessive intestinal putrefaction in more than 70 per cent of over 200 cases of epileptics investigated. Clinical experience at the Battle Creek Sanitarium during the last 45 years has shown in a great number of cases a definite connection between the intestinal toxemia which results from chronic constipation and a high protein diet and the various forms of epilepsy. It has been definitely proven not only by the experience of the writer and his colleagues but by that of hundreds of other physicians, that the suppression of intestinal putrefactions by increasing the activity of the intestines and placing the patient upon

an antitoxic diet, excluding meats of all kinds, may wholly control epileptic convulsions in many cases and in nearly all cases greatly lessen their frequency and severity. In not a few instances complete and permanent cures have been effected, if not with diet alone, by regulation of the diet in connection with other measures which without diet regulation have proved entirely inefficient.

Disease of the Thyroid Due to Colon Poisons

First Combe and Ewald, and later others, called attention to the beneficial effects secured by withdrawing meats of all kinds from the diet of persons suffering from disease of the thyroid gland. Cases of myxedema and simple goiter are benefited as well as cases of exophthalmic goiter and hyperthyroidism.

The practice of eliminating meat from the diet in cases of this sort is well supported by Breisacher's experiment by which it was proven that dogs whose thyroid glands had been removed do very well on a diet of bread

and milk although they develop convulsions and die within a few weeks when given meat.

It has long been known that rabbits tolerate removal of the thyroid gland so well that in many cases they appear to be almost uninjured by the operation, doubtless because of the small amount of putrefaction products in their intestines.

Congenital Effects of Autointoxication

McCarrison has demonstrated by experiments on goats that congenital goiter may be caused by the absorption of fecal matters from the intestine of the mother. Fecal contamination through soil or water may possibly be the source of congenital goiter in human beings as well as in goats. Absorption of putrefaction products from the intestine overtaxes the capacity of the thyroid of the fetus, leading to compensatory overgrowth. The inference is a fair one that thyroid disease in adults may arise from the same cause.

Pernicious Anemia

A disease which is becoming constantly more prevalent in civilized countries, and which in its advanced stages offers no hope

for recovery, is believed by many clinicians to find its origin in intestinal infection due primarily to constipation. The putrefaction of food residues in the colon affords a favorable opportunity for the development of pernicious organisms which give rise to colitis. As the resistance of the intestinal mucous membrane is broken down by the destruction of its protective epithelial covering, the bacterial poisons swarm into the blood and in time break down the resistance of the blood and the tissue fluids. This lowered resistance is manifested in pyorrhea, decay of the teeth, degeneration of the liver, kidneys and of the glands of the stomach, leading to achylia. The blood making organs finally degenerate, producing changes in the blood characteristic of pernicious anemia. Lastly, degeneration of the spinal cord develops and paralysis makes its appearance, sometimes accompanied by mental indications of degeneration of the brain. Cases which have reached this stage are hopeless, but in the early stages of the disease recovery not infrequently occurs as the result of changing the intestinal flora and strictly following an antitoxic regimen.

Herter observed that carnivorous animals are much more likely to develop pernicious anemia, especially in the later years of their lives, saying "that it is usual in the later years of life for meat eating animals to show a much diminished volume of blood and at least a moderate fall in the hemoglobin. Instances are stated to be not uncommon in which a pernicious type of anemia has developed in the carnivora. On the contrary, among the herbivora it is said that pronounced anemias are very rare."

CHANGING THE INTESTINAL FLORA

The plants which grow in a region constitute its "flora." Germs are the lowest order of plant life. The different germs which grow in the colon together constitute its flora. Germs which cause fermentation of starch or sugar and which form acids are harmless. Germs which decompose albumen or protein and cause putrefaction produce ammonia and many other highly poisonous substances. These are pernicious organisms which are the cause of many maladies and induce premature old age. These are the germs called "wild" by Metchnikoff and believed by him to be the cause of old age.

Dr. Tissier, of the Pasteur institute, was the first to point the way to methods of changing the flora of the intestine. His plan was to displace the "wild," noxious, poison-forming bacteria which have taken possession of most adult intestines through wrong habits of life, especially in diet, by harmless, acid-forming species, such as Nature plants in the intestines

of the young infant within a few days after birth.

There are various ways in which the intestinal flora may be changed. Two things are essential:

1. The diet must be such as to encourage the growth of friendly germs, the acid-formers, and discourage the growth of unfriendly and undesirable ones, the poison-formers. This requires a fleshless diet and in some cases a diet free from animal protein, that is, a diet which excludes eggs and milk as well as meats of all kinds.

2. The bowels must be made to move three times a day or more frequently so as to hasten the displacement of the undesirable bacteria and to dislodge them from their hiding places. The colon must be thoroughly emptied daily.

The necessary change of diet may be sometimes effected by adopting the "milk regimen" for a limited period. The "fruit regimen"—fresh fruit and such green vegetables as lettuce, celery, and cucumbers answers the same purpose. The "whey cure," "kumyss cure," and "milk cure" and other dietetic

methods of changing the flora are highly useful. Fasting will not change the flora.

For a thorough change of the flora a special regimen with careful technic is needed for the uniform success which is possible by recently perfected methods. To keep the flora changed an antitoxic diet must be adopted and carefully followed and the thoroughgoing technic for completely changing the flora must be repeated at rather frequent intervals.

B. acidophilus, discovered by Moro, has been proven to be the chief acid-forming or protective organism of the colon. This germ is present and dominant in the stools of healthy infants, also in the stools of milk-fed calves and other milk-eating animals and even in the droppings of milk-fed chickens. So long as the *B. acidophilus* is dominant, putrefactive changes in the colon are absent or very slight. The *B. acidophilus* can grow in the colon only when it has an adequate supply of lactose or dextrine. Cow's milk encourages the growth of the *B. acidophilus* because it contains 4 per cent of lactose. In the use of *B. acidophilus* to change the intes-

tinal flora it must be used in liberal quantities. A few tablets or a few drops of the culture accomplish little, at least are insufficient to effect a material change in very pronounced cases of autointoxication. To change the flora and to keep it changed it is necessary to employ large quantities of culture. Either whey or milk cultures are best suited for this purpose.

Milk culture, or so-called acidophilus buttermilk, may be prepared at home and should be used in quantities of two to three pints daily in connection with an antitoxic diet, that is, a diet from which meats of all kinds are rigorously excluded. In preparing acidophilus buttermilk it is necessary that the milk should be thoroughly sterilized and that a freshly prepared and efficient culture should be employed. The culture should be obtained from a reliable laboratory to insure efficiency.

The following method of preparing acidophilus buttermilk has been found satisfactory: To one pint of evaporated condensed milk (unsweetened) add an equal quantity of boiling water. Cover and allow to stand until

cooled to a temperature of 105 degrees. Put in a thermos bottle together with one ounce of a pure fresh liquid culture of acidophilus. Stopper the bottle, shake two or three times to insure complete mixture of the culture with the milk, wrap in a heavy woolen blanket and put in a warm place for 24 to 36 hours. In cold weather a two quart fruit jar half full of boiling water should be wrapped up with the thermos bottle to make sure that a temperature of about 100 degrees is maintained for 24 to 36 hours. Shake the bottle before opening. If desired, the buttermilk may be beaten with an egg beater after removal from the thermos bottle to make "smooth."

Acidophilus buttermilk is less acid than ordinary buttermilk often is. It should be freshly prepared every day. The buttermilk itself cannot be used as a starter for a new lot as it becomes contaminated with air germs which grow more rapidly than the *B. acidophilus*, and so prevent development. Care must be exercised that the containers used are thoroughly cleansed in boiling water to prevent contamination. The more closely the bacteriological laboratory technic is followed

the better will be the quality of the buttermilk.

Changing the Intestinal Flora without Cultures

Even in cases requiring change of the intestinal flora, including pretty nearly all civilized human beings, the *B. acidophilus* is still present in the colon although in very small numbers, the putrefactive flora having taken possession of the field. A good flora may be restored without the use of cultures by administering large quantities of the special carbohydrates which are needed by the *B. acidophilus* to enable it to grow with such luxuriance as to overwhelm and drive out of the intestine the putrefactive bacteria. The latter method is in some respects preferable to the first. If we encourage the growth of the protective organisms present by proper feeding we shall be certain that the results secured may be easily made permanent by continuing the proper feeding. If, on the other hand, we administer quantities of the organism which have been grown outside of the body, the good results secured will only last so long

as the cultures are being given in large quantities, for they will not grow and develop in the body unless encouraged by special feeding with lactose or dextrine.

Lactose and dextrine are the only carbohydrates that can be relied upon to encourage a luxuriant growth of *B. acidophilus* in the colon. These carbohydrates are absorbed much more slowly than others and are thus able to reach the colon before complete absorption. To make certain that a sufficient amount of lacto-dextrin reaches the colon to change the flora, that is, to encourage the growth of the *B. acidophilus* sufficiently to make it dominant and discourage the growth of the putrefactive organisms, it is necessary that large doses should be taken.

Lactose has been found inconvenient for several reasons. First, it sometimes gives rise to nausea; second, it becomes after a few days repugnant to most persons; third, it is difficult to dissolve; fourth, and perhaps the most important of all, the use of such large quantities of sugar for a considerable period sometimes causes the appearance of sugar in the urine. This might prove to be highly in-

jurious to a person already having a tendency to diabetes. Dextrine is equally as valuable as lactose for changing the flora, but its use for human beings is impracticable because its taste is so disagreeable it is practically impossible to swallow the quantity required. The objectionable features of both lactose and dextrine have been overcome by combining the two, not by simple mechanical mixture but by adding lactose to a specially prepared dextrine in such proportions as to produce a readily soluble, highly agreeable product which may be used without difficulty for an indefinite period of time.

This product, known as lacto-dextrin, not only changes the intestinal flora but is a highly concentrated food, each ounce having a food value of about 120 calories.

Another important advantage of lacto-dextrin is the fact that it contains the important antiscorbutic vitamin C, which is wholly lacking in lactose, and is necessary for the utilization of carbohydrates.

The Quantity of Lacto-Dextrin Required

For rapidly changing the intestinal flora it is necessary to administer large doses, sufficient to fill the alimentary tract, or otherwise the total amount taken may be absorbed before reaching the colon, where its presence is necessary to encourage the growth of the *B. acidophilus*. This amount varies in different persons. On the average the required dose is two to three ounces. This quantity must be taken three times a day. In exceptional cases four or five ounces may be required. These are cases in which the intestine is so badly crippled that so long a time is required for the lacto-dextrin to reach the colon that an unusual proportion of it is absorbed. These large doses must be taken until the flora is changed, and afterwards doses half as large will generally suffice to maintain the change, that is, to prevent the return of the intestinal putrefaction and consequent auto-intoxication.

The Best Time for Taking Lacto-Dextrin

Lacto-dextrin may be used advantageously at any time, with meals as an addition to fruits, or between meals as a drink—it makes a very agreeable beverage. An excellent time for taking lacto-dextrin in ordinary cases is about one hour before each meal. It should be taken with a liberal quantity of water. A full dose requires about 12 to 16 ounces or two large tumblerfuls of water. The product is more readily soluble in hot water than in cold, hence hot water is decidedly preferable. A convenient way for taking is to put about one-half the dose, two heaping dessert spoonfuls, in a tumbler, add an equal quantity of hot water, stir quickly with a fork till smooth, then add hot water to fill the tumbler. After swallowing this, prepare another similar dose. Repeat this before each meal.

Not infrequently the taking of a large dose of this concentrated food a short time before a meal lessens the appetite. This need not give alarm, for it is to be remembered that lacto-dextrin is itself a highly concentrated food.

A heaping dessert spoonful represents about 100 calories, and the full day's dose represents fully half the amount of food required by the average individual engaged in light employment. Persons who are overfat or of average weight and hence do not desire to add to their weight must necessarily reduce the amount of food eaten while taking lacto-dextrin. Such persons should make the diet consist chiefly of coarse vegetables such as cabbage, cauliflower, green peas, string beans, lettuce, celery, Brussels sprouts, asparagus and fresh fruits of all sorts with a moderate allowance of bread, potatoes, cereals, milk, buttermilk, etc. Persons who are thin in flesh and desire to add to their weight should take the lacto-dextrin about three hours after meals. When taken at this time lacto-dextrin does not lessen the appetite for other food and so may be taken in addition to the regular full diet and will thus insure a decided and usually very rapid gain in flesh.

To Keep the Flora Changed

This is not a case in which the theological doctrine of "Once in grace, always in grace" is applicable. Even when the flora has been completely changed, if the measures employed to effect a change are completely withdrawn, the old putrefactive flora will be found back in full force within a week or ten days. To keep the flora changed requires a constant battle.

The things which must be done without fail and systematically are the following:

1. The bowels must be thoroughly emptied every day. To insure this, the bowels should be trained to move three times a day or after each meal. In many cases an additional before breakfast movement occurs and this is advantageous. To secure this efficient action of the bowels the use of large quantities of bulky foods is necessary together with proper lubrication. An ounce to an ounce and a half of bran is required in obstinate cases and paraffin oil in liberal quantities is also needed. Fresh fruit, greens and such vegetables as lettuce, celery, cabbage, beets, parsnips, etc.,

should be freely used. Bulky or laxative foods must be used in liberal quantities, not once a day only, but at every meal. If one of the daily meals is taken away from home at a lunch counter, hotel or restaurant, a quantity of "ballast" may be taken along in the pocket. Laxa is especially excellent for this purpose. This is a combination of bran and agar, which is the most efficient form of roughage with which the writer is acquainted. It is prepared in the form of a biscuit which may be carried in the pocket and is quite palatable and easily eaten either with or without other food. If the ordinary meal is omitted, one or two laxa biscuit may be taken with a little fruit so as to avoid interrupting the normal intestinal rhythm.

2. An antitoxic diet must be closely followed, that is, meats of all sorts, including fowl, fish, etc., must be rigorously excluded from the diet. This is necessary not only for rapidly changing the intestinal flora but after the flora has been changed to prevent reinfection of the intestine. A single chop or serving of fish or chicken may suffice to re-inoculate the intestine with the putrefactive flora and

render necessary a new campaign to change the flora by means of large doses of lacto-dextrin. In some cases even eggs must be used very sparingly. The yolk of the egg is preferable to the white, being less putrescible and less likely to encourage putrefaction in the colon. When eggs are eaten, the greatest care should be taken to insure perfect freshness. In hot weather an egg will not remain fresh for more than two or three days, and ordinary commercial eggs are quite liable to contain bacteria even when perfectly fresh. Bacteriological examinations of eggs have shown that about one egg in seven is infected when laid. It is necessary that the food and surroundings of chickens should be thoroughly clean in order to insure that the eggs are wholly free from bacteria even when fresh. Eggs from milk-fed chickens are of the best sort.

3. Three or four ounces of lacto-dextrin should be used daily. In many cases a single morning dose of two to four heaping dessert spoonfuls is found to be efficient. This dose in many acts as a decided laxative. Changing the flora always increases the efficiency of the

colon. If acidophilus buttermilk is used, about two pints should be taken daily to maintain a good intestinal flora. Perhaps the best plan of all is to combine the buttermilk with lacto-dextrin. When this is done only a half dose of each will be required, say two or three tablespoonfuls of lacto-dextrin daily and one or two glasses of buttermilk.

When lactose or dextrin is administered to change the intestinal flora gas production is often at first greatly increased, causing frequently a considerable degree of discomfort. This may be taken as an indication (1) that the Welch's bacillus is present in large numbers and (2) that the lactose or dextrin is reaching the colon in efficient quantities. The increased gas production due to the action of the Welch's bacillus upon the carbohydrate is fortunately accompanied by a production of lactic acid which will soon stop the growth of the Welch's bacillus, which is highly sensitive to acid, ceasing to grow in the presence of one-tenth of one per cent of acid, whereas the protective *B. acidophilus* and other acid-loving organisms are capable of growing in the presence of one-half of one

per cent of acid. The colon bacillus also produces gas in considerable quantities and in many cases is the chief cause of gas production.

In efforts to change the intestinal flora it is important to reduce the intake of food. It is especially important that the amount of protein should be reduced. An excess of food always encourages the growth of the pernicious organisms in the colon. On this account, a fruit regimen for a few days (three or four days) is particularly advantageous. In cases accompanied by emaciation in which the milk regimen is indicated care should be taken to change the flora by a few days of fruit regimen with lacto-dextrin before beginning the milk feeding in order to avoid increased growth of the putrefactive organisms which will result from the introduction of the great excess of protein into the colon which necessarily accompanies systematic milk feeding.

Herter lays special stress upon the suppression of foods containing putrefactive bacteria, remarking, "It is clear that in such cases the greater the freedom of the food

from putrefactive bacteria, the less will be the liability to putrefaction at lower levels" (that is, below the stomach).

Herter insists that milk which contains Welch's bacillus, *B. putrificus* and other putrefactive organisms should be sterilized. He also calls attention to the fact that cheese commonly contains large numbers of putrefactive bacteria, and remarks, "Cheese is therefore an article generally to be excluded from the dietary of nearly all cases of excessive chronic intestinal putrefaction." Cheese freshly prepared from clean milk, cottage cheese, is permitted. Attention is specially called to the fact that in the use of uncooked fruit great care must be taken to avoid the bacteria found on the surface of fruits. Among the pernicious organisms with which fruits are frequently infected are the *B. putrificus* and the bacillus of malignant edema, two exceedingly pernicious organisms. These Rettger has found to be very abundant on the skins of bananas.

Herter lays emphasis upon the thorough cleansing of the teeth so as to avoid infection of the food with the putrefactive bacteria

which develop in the mouth when the teeth are not well cleansed.

Herter also prohibits the use of condiments, insists upon the thorough mastication of the food and calls special attention to the fact "that the intestinal contents of carnivora (meat-eating animals) contain many more putrefactive, spore-bearing bacteria than is the case with the herbivora."

Change of the intestinal flora is one of the most efficient of all means to be employed for combating constipation. This is true for the reason that putrefaction gives rise to ammonia and other alkaline products which paralyze the colon. That all alkalies have this effect is a well established physiologic fact, while it is equally well established that acids excite the colon to normal activity. The addition of the juice of one or two lemons to the water employed as an enema is an efficient means of stimulating the bowel when this is necessary.

When the flora has been thoroughly changed, the normal acid-forming organism *B. acidophilus* being dominant, acids are constantly formed in the colon which excite it to

normal activity and tend to restore it to a normal condition.

The "Milk Regimen"

Cow's milk is not a complete food for grown-ups, either human or bovine. Milk is deficient in iron, and contains an excess of protein and lime. Cow's milk disagrees with some persons, children as well as adults. It is, nevertheless, highly valuable as a supplementary food, and when properly employed, renders invaluable service in supplying lime and a superior quality of protein and other easily assimilable elements.

The "milk regimen" differs from a milk diet in the fact that it requires the giving of milk in a particular way and in combination with bran and paraffin oil. The full details of the "milk regimen" are described in the author's work, "Autointoxication."

DIFFERENT FORMS OF STASIS AND CONSTIPATION

Constipation is not a disease, but a symptom. It may have as many different causes as headache or inability to sleep. It is important to bear this fact in mind for the evident reason that a condition due to varied causes must require different measures of treatment. It is also important to recognize the fact that the real evil to be combated is stagnation, which may or may not be accompanied by constipation.

Constipation is defined by the dictionaries as a condition in which "the evacuations are obstructed or stopped and the feces are hard and expelled with difficulty." A medical dictionary defines constipation as "infrequent or difficult evacuation of the feces." These definitions express the idea respecting the condition commonly known as constipation generally held by both the profession and the laity. Unfortunately, the word *constipation*, as thus defined, does not properly represent the fundamental condition of which the so-

called constipation is a symptom only and which is the source of the toxemia, colitis and numerous other morbid conditions associated with constipation. This fundamental condition is stagnation or prolonged retention of the food residues and body wastes in the colon. This condition is technically known as *stasis*, a word derived from the Greek meaning stoppage.

But stasis in the colon is not necessarily associated with either infrequent or difficult bowel movements. Not infrequently bowel movements are abnormally frequent and "loose" when very marked stasis is present. Frequent, loose stools are, in fact, present in a great many cases of autointoxication or intestinal toxemia through long retention and consequent putrefaction of the colon contents. It is apparent, then, that the word constipation does not really describe the condition with which we are dealing since we may have stasis with frequent movement as well as with infrequent evacuations. As a matter of fact, in the very worst cases of stasis, those in which the symptoms of autointoxication are most pronounced, six or even more bowel move-

ments may occur daily. What matters, is not that the bowels should move so frequently, but that the colon, at least the greater part of it, should be completely emptied at each movement. This is normally accomplished by three or four daily evacuations. When three complete evacuations occur daily there is little opportunity for the putrefaction of food residues and wastes in the colon and consequently the amount of toxins produced and absorbed will be small. On the other hand, when one evacuation occurs daily, the retention of fecal matters, as shown by Hurst and others, will be 48 hours or more, a period which allows abundant opportunity for putrefactive changes. But it is not to be forgotten that there may be three or four or twice as many evacuations daily without the colon being at any time thoroughly emptied. This is, in fact, the condition usually present in chronic diarrhea. X-ray examinations made in these cases frequently demonstrate the retention of fecal matters for three to five days and in some cases even longer. It thus happens that many persons who think they are not constipated because their bowels move

daily, and who are not constipated in the sense in which the term constipation is ordinarily used, may nevertheless be suffering from stasis and perhaps to a very high degree.

These facts, which have been made clear by X-ray studies of the colon by physiologists and roentgenologists within the last twelve or fifteen years, require not only a new definition of constipation but a new classification of cases. Most cases of constipation may be divided into two classes:

1. *Simple or rectal constipation* in which only the left half of the colon, or simply the rectum, is involved.

2. *Cecal constipation* in which, although the entire colon is involved in the disease, the stasis or retention of fecal matters is chiefly confined to the cecum.

In simple constipation the fecal matters accumulate chiefly in the rectum and the pelvic colon where the fecal masses sometimes become so dry and hard that it is necessary to remove them by mechanical means. These hard, dry feces when examined are found to have comparatively little odor. The bacteria are nearly all dead, scarcely one per cent

being found alive, although Strassburger found in some cases that nearly one-half the whole fecal mass consists of dead and living bacteria.

Cecal Constipation

In cecal constipation the fecal matters remain fluid. Because of this fact, together with their long retention, a very advanced stage of putrefaction is reached; hence the characteristic differences between the two forms of constipation, simple, or left sided, and cecal, or right sided. In left sided constipation the stools are hard, dry, infrequent and have little odor, and in many cases these patients show few of the symptoms of autointoxication, the chief symptoms being backache, sometimes headache and a coated tongue and slightly malodorous breath.

In the right sided or cecal form of constipation the stools are loose and frequent and are very foul smelling. Considerable quantities of mucus are often present and the general symptoms of autointoxication are usually pronounced. Achylia is frequently present, the tongue coated, the breath bad, the teeth

usually badly decayed, the skin sallow, the urine concentrated and loaded with toxins, often showing casts, and in many cases the liver is found enlarged, and tests for renal efficiency show that the kidneys are becoming diseased.

The so-called right sided, or cecal constipation, is the advanced stage of intestinal stasis. The history of these cases begins with ordinary simple constipation. The long retention of fecal matters in the lower part of the colon leads to infection and colitis with contraction of the descending and pelvic colon as a result of which fecal matters are held back in the right side of the colon so that the stasis is transferred from the left side to the right side. The larger amount of water present with the food residues in this part of the colon encourages the development of putrefactive organisms in increased numbers and virulence, and the mucous membrane of the cecum becomes diseased. The infection may even extend to the small intestine. The cecum becomes dilated, adhesions of the appendix or cecum are developed so that the cecum is not only weakened by the over-

stretching of its muscular walls but is held fast by adhesions so that it cannot perform its function of contracting upon its contents and lifting and pushing the food residues over into the transverse colon. The ileocecal valve is destroyed by the dilatation of the cecum and as a result the putrefying contents of the cecal cesspool are allowed to pass back into the small intestine. The active reverse movements which take place in the colon beginning soon after a meal tend to force the contents of the cecum back into the small intestine, thus increasing the absorption of putrefaction products. So long as these putrescible materials are retained in the colon the amount of absorption is comparatively slight; but when they are forced back into the small intestine, where absorption is exceedingly rapid, these putrefactive poisons rapidly find their way into the blood stream and give rise to the numerous disturbances which are rightly attributed to intestinal toxemia. Cecal constipation is thus only the advanced stage of simple or rectal constipation which begins with the lower bowel as the result of neglect to answer the call of nature for bowel movement.

Mixed Cases. In most cases of chronic constipation, both the right and left sides of the colon are affected. The disease, beginning in the rectum, has gradually extended to the whole colon. Colitis in some degree is practically always present. The rectum is insensitive, the pelvic or descending colon spastic and the cecum dilated; and in many cases there are adhesions of the cecum as well as a prolapsed and often adherent condition of the pelvic colon. These mixed cases are often named in accordance with the dominant symptoms present. If the stools are dry and the rectum much dilated and insensitive, the case is called *rectal constipation*. If the colon is highly spastic and the intestine sensitive and painful, *spastic constipation* will be the diagnosis. If stools are frequent and perhaps a little loose and very putrid, *latent constipation* will be the designating term. But in all cases, the fault is the same, stasis or delay in the disposal of the food residues and wastes, and all the various morbid conditions present are the results of the infection growing out of putrefactive changes and the growth of pernicious bacteria in the colon.

In well pronounced cases of simple constipation, a considerable quantity of feces will always be found present in the rectum, although in a certain number of cases the accumulation occurs only in the pelvic colon. The latter cases are sometimes the most difficult of relief, because of the existence of obstruction at the pelvi-rectal valve, or of adhesions of the pelvic loop to the floor of the pelvis. Sometimes the pelvic colon has become so large by overstretching that, when filled, it is so heavy that it cannot rise, but becomes impacted in the hollow of the sacrum, folded upon itself and incapable of emptying itself. In such cases, bowel movements occur only as the result of pressure from accumulation of feces in the colon, a process which necessarily involves great distension of the colon and resulting injury to its walls, and to the ileocecal valve, which is often rendered by this means wholly incompetent.

When in these cases of rectal constipation the bowels are made to move by straining efforts, the rectum is often not emptied. A few masses of hard, dry feces, sometimes a

single mass covered with mucus, may be extruded, but a thorough emptying of the bowel never occurs. In cases in which the rectum has not wholly lost its sensibility, the sense of weight and pressure often lead to many repeated efforts during the day to relieve the bowels, with the result of securing perhaps each time a small movement. This has been termed "fragmentary constipation" by Boas, the eminent Berlin specialist, but it is only a form of simple constipation.

A marked symptom of latent constipation when associated with incompetency of the ileocecal valve is the great amount of intestinal gas from which it is impossible to get entire relief. This is due to the fact that the gas generated in the colon escapes into the small intestine and cannot be wholly expelled because the colon discharges its contents internally, into the small intestine, as well as externally. A copious hot enema usually affords relief in such cases.

THE CARMINE TEST FOR INTES- TINAL MOTILITY

The length of time required for the passage of material through the alimentary canal may be readily ascertained by the administration of some substance which will give to the intestinal contents a decided color which can be easily recognized. Animal charcoal, carmine and even highly colored fruit, such as the huckleberry, may be used for this purpose. It is necessary, of course, that while taking the test care should be taken to avoid taking foods of such a color as might lead to confusion with the color of the test substance. In applying the test, two capsules containing five grains each of carmine are usually given at breakfast, say at 8 A. M. Each stool is afterwards examined and the time noted when the red color of the carmine appears. The examination of the stools continues until the color disappears. This time is also noted.

From a large number of observations, several hundred, it has been determined that in a normal person the color should make its

appearance within twelve hours from the time it has been taken and should disappear within twenty-five hours. In a considerable number of persons, the color appears in less than twelve hours and disappears in eighteen hours or even less. It is probable that the shorter periods mentioned are more nearly the normal and that the periods of twelve hours for appearance and twenty-five hours for disappearance should be regarded as the extreme limits of normal motility. The normal time for the stomach to empty itself is four to five hours. At the end of seven or eight hours, the small intestine should be emptied and the unutilized food residues should be found wholly in the colon. These residues normally find their way to the rectum in three or four hours more, and there seems to be no good reason why unusable and putrescible materials should be retained for a longer time, to undergo decomposition and contaminate the blood through the absorption of the poisonous products.

In barnyard fowls, the length of time required for food to traverse the entire alimentary canal is three hours and a half. In some

animals, the period is not more than one hour.

In cases of chronic constipation, the time for the appearance and the disappearance of the test color is very greatly lengthened. The time of appearance is not infrequently prolonged to twenty-four or thirty-six hours and the time of disappearance is, in a large proportion of cases, forty-eight hours or more. Seventy-two hours or three days is not an uncommon observation, and the writer has observed cases in which the color did not disappear until the end of four days and, in one case, six days. Cases are occasionally observed in which the color disappears and then reappears. The explanation of this circumstance is the existence of a greatly dilated cecum in which a portion of a meal may be retained while the residues of a subsequent meal pass over and on to exit.

By means of the carmine test, the degree of stasis or stagnation of intestinal contents may be ascertained and the improvement resulting from diet or treatment may be observed. This test is one that ought not to be omitted in any case of obstinate constipation which does not readily yield to the measures applied and it is advantageous in all cases.

THE TREATMENT OF CONSTIPATION

Hygiene

The first point of importance in the treatment of constipation is hygiene. Chronic ill health always involves, either primarily or secondarily, a lowering of the vital status, and is in most cases not a result of a single error in habits of life, but of numerous infractions of the rules of healthy or biologic living. So many different factors are involved in the function of bowel movement, that it is highly essential that a person who is suffering from chronic constipation should seek by every available means to improve his general health, and thus increase the vigor of all his bodily functions. Disease is cured by the body itself, not by doctors or remedies.

If one's habits have been sedentary, he must make a radical change in his mode of life. When possible, a change from an in-

door employment to an active occupation out-of-doors is most desirable.

If the circumstances of life have been such as to give rise to worry or nervous depression, some change should be effected by which the causes of irritation and depression may be gotten rid of; or the individual should, by the cultivation of optimism, endeavor to rise above the influence of his surroundings.

Constipation is in most cases simply one of the unhappy results of the artificial conditions imposed upon us by modern civilized life. The only escape from this terrible handicap of all useful human activities is to be found in a rational return to Nature, in the adoption, so far as is necessary to secure the physiological conditions, of natural and primitive habits, particularly in reference to diet, sleep, exercise, and out-of-door life.

Before proceeding further the reader who is making a serious study of this subject is asked to re-read carefully two of the preceding chapters, entitled, "Influences Which Normally Excite the Movements of the Colon" and "Influences Which Discourage or Lessen Intestinal Movements," bearing

always in mind the fact that for the successful treatment of constipation every possible factor which aids bowel activity must be utilized, and that every factor which has a discouraging influence must be most carefully avoided.

Constipation Always Curable

Every person who undertakes to combat constipation should know at the start that his efforts if thorough-going and persistent may be expected to win. There are many thousands of sufferers who have become utterly discouraged through unsuccessful efforts and have become convinced that the malady is incurable, and that nothing more can be done than to mitigate the evils of the malady as much as possible by laxative drugs notwithstanding their well-known evil effects. There are many thousands of others who depend wholly upon the use of laxative drugs or mineral waters for bowel movements, who are unaware of the harmful effects which inevitably result from the long continued use of drugs which force bowel movement by creating an artificial irritation. The majority of

such persons are always looking for some new laxative drug to take the place of one which has lost its effects, fully believing that there is no other way.

There is apparently a widespread belief that constipation is incurable. This hopeless view, quite generally held by the laity, is the very natural result of the wrong methods which are generally employed, and the great ignorance concerning the intimate nature and causes of constipation. This ignorance has been quite excusable, however, because of the lack of scientific knowledge respecting the physiology of bowel action. But now that the light of new discovery has illuminated this dark corner of human physiology, the treatment of constipation is no longer necessarily a hopeless groping in the dark but may be made a regular organized campaign against an enemy whose nature and favorite haunts are known and against which recent medical science has provided efficient weapons.

And a veritable campaign the effort must be if success is to be attained in really grave cases. But victory may be attained in every case. It must be understood, however, that

there is no panacea for constipation. There is no simple means by which all cases may be cured, and some cases require the simultaneous employment of almost every known rational remedy. A very few cases require the aid of surgery; and even surgery seldom succeeds when made the sole reliance. Fortunately surgery is very rarely needed when all other means are efficiently used.

What Is a Cure of Constipation?

When a child has measles or scarlatina or when a person suffers an attack of typhoid fever, the usual result under modern management is such a recovery that no traces of the disease or its effects are discoverable. The individual is apparently as well in every respect as before the illness. Modern medical research has taught us, however, that this completeness in recovery is more apparent than real. Besides the permanent injuries to eyes and ears, which are often left after measles and scarlet fever, there are not infrequently far more serious injuries to heart, lungs, or kidneys. And statistics show that whenever typhoid fever and small-pox are

prevalent, pulmonary tuberculosis increases. Thus we know that recovery does not really mean, even in acute disease, absolutely complete restoration to former soundness.

In chronic disease this is still more evident. An attack of acute disease is like a sudden outburst of flame in a dwelling from the upsetting of a lamp or from some similar accident. The fire is usually quickly extinguished and the house itself is little injured. A chronic malady is often like a fire which has begun in the basement of the house and has gradually worked its way up in the inner walls until it has reached the top and burst out in flame through the roof. Acute disease we may say is analagous to a fire *in* a house while chronic disease is a fire *of* a house. In lung tuberculosis a cure means an arrest of the disease process and a healing of ulcerated surfaces in the lung; but lung tissue which has been destroyed is not restored; and the consumptive who has been cured by the out-of-door life and other means must continue to employ the essentials of the curative treatment in order to keep well. No consumptive can expect to remain well if he returns to the

old conditions of life under which he became ill. He must make a radical change in his habits of life and the change must be permanent. In case of an injury to a leg, the patient may recover, but with the loss of a leg. By the aid of an artificial leg he will be able to walk very well, but not so well as with a natural limb.

The situation is exactly the same in constipation. In very chronic cases, much irreparable damage has been done. The colon has been permanently crippled. The art of treatment is to find out the exact nature of the injury and to find means for supplying the needed aid, much as an artificial leg in a large measure supplies the place of a missing limb. These measures must be such as render aid in a physiologic way, and must be harmless in character. When once the necessary means have been found and adapted to the individual case they must be perseveringly employed not for a few days or weeks or months; their use must become a life habit. In general it is usually possible to secure such a degree of improvement that a few and simple means will afford all the aid required, al-

though at first the concerted use of many measures may be required.

If, for example, it is found that the addition to the food of a liberal quantity of sterilized wheat bran will secure three normal bowel movements daily, this simple means must be faithfully used, not only daily, but at every meal. If it is found that the bowels are ready for evacuation at a certain hour, a natural "call" being experienced at that time, this hour must be religiously set aside for this duty. Nothing should be allowed to interfere with this duty. Whatever plan or program is found to secure efficient bowel action, this program must be carried out every day with greatest circumspection. Nature must not be discouraged or thwarted in her efforts. Every pains must be taken to foster every symptom of returning normality in bowel functions. When a "call" occurs, it must be answered at once. The delay of a few minutes only may extinguish the effort Nature is making to re-establish the normal rhythm. It takes considerable will and character to conquer constipation as well as knowledge and perseverance. But the gain

in clearness of mind, zest for work, endurance of mind and body, and general efficiency, to say nothing of such gains as keenness of appetite, sweetness of breath, clearness of skin, sound sleep and sense of joy in being alive, are ample compensation for the effort required. If it is a life-long battle to conquer constipation, it may be a winning battle and one which lengthens one's days and wonderfully increases capacity for useful activity and enjoyment of life.

When Is Surgery Needed?

It will not be possible to review in a brief paragraph the various opinions which have been expressed by eminent medical authorities respecting the indication for surgical relief in cases of obstinate constipation, nor to offer the reasons for or against the various surgical procedures which have been proposed. It must suffice simply to enumerate the principal conditions concerning which the consensus of authoritative surgical opinion is settled and clearly defined.

Constipation due to organic obstruction resulting from tuberculosis, cancer, or other

morbid growths, necessarily requires surgical interference, and an abdominal surgeon should be consulted at once, one experienced in intestinal surgery. This is important, for in surgery of this character results depend almost wholly upon exactness and perfection of technic, such as can be gained only by long and extensive practice.

Chronic as well as acute appendicitis is a condition which may open the way for relief of constipation by removal of an active cause. This is especially true in cases in which an X-ray examination shows many adhesions about the inflamed appendix, which fix the cecum so that it cannot empty itself or perhaps cause obstruction of the lower end of the small intestine. The necessity for operation may exist in cases of this sort, even when little pain is felt in the region of the appendix. Not every case in which such adhesions exist, however, requires operation. By far the great majority may be substantially relieved by non-surgical measures.

Adhesions of the ascending or descending colon, and especially adhesions which compress the pelvic colon and limit its move-

ments, may be relieved by appropriate surgical procedures when other means fail. These cases seldom require removal of the colon or any portion of it, or even the so-called short-circuiting operation which affords only very temporary relief unless care is taken to restore the ileocecal check valve. When adhesions of the pelvic colon are broken up the pelvic loop must be suspended in such a way as to prevent the reproduction of the restricting adhesions which will almost certainly occur unless some efficient means of prevention is adopted.

A very definite indication for operation in certain cases in which other means fail is incompetency of the ileocecal valve accompanied by very pronounced stasis or stagnation in the small intestine. This condition is sometimes accompanied by the most incorrigible constipation and by most pronounced intestinal toxemia as shown by enormous quantities of indican and other putrefactive products in the urine and by intractable headaches. An operation has within a few years been devised by which the incompetent valve may be repaired so as to effect a radical cure

of the incompetency of the valve and, fortunately, without any considerable degree of risk. This operation has been now performed in a sufficient number of cases to demonstrate its value in cases which do not yield to other measures.

The perfection of practical methods for changing the intestinal flora by means of which the change may be accomplished with reasonable promptness in practically all cases have rendered unnecessary most of the operations devised by Lane and others for the cure of intestinal stasis. Even at Guy's Hospital, London, where Mr. Lane developed his operations for short circuiting and removal of the colon, according to recent reports, these operations are no longer performed, or at least are resorted to only very rarely. When the flora has been thoroughly changed, stasis usually disappears. If there still remains some degree of stasis no harm is done because putrefaction with the resultant development of poisonous products is prevented.

Regularity of Meals Necessary

The bowels do not move without a reason for moving. The pelvic colon is an ejecting apparatus for expelling fecal residues, which works only when brought into action by the reflex nervous mechanism which comprises the nerves of the rectum, the defecating center, and the connecting nerve trunks. The entrance of food into the rectum is like the closing of a switch which controls the starting and stopping of a motor. When the rectum is distended, the nerves are stimulated, and in turn excite the defecating center where they originate. From this center are sent out impulses which cause the pelvic colon to contract strongly and empty itself. In doing this it is assisted by strong contractions of the abdominal muscles and of the rest of the colon.

This process, it must be remembered, is set in operation only when there is a sufficient movement of feces from the pelvic colon, where the feces are stored, into the rectum, to produce the necessary amount of stimulation. As we have already seen, this is accom-

plished, normally, by peristaltic movements set up by taking into the stomach relishable food. In constipation, these stimulating reflexes are often weak, and must be reinforced by every means possible. Hence the diet must be so managed as to secure the maximum amount of stimulating influence upon the lower bowel. Eternal vigilance is necessary; every meal must be taken with reference to the bowel action. A single omission of a meal, or a meal of unsuitable food, may be sufficient to produce stagnation, and unless this is at once corrected, the most serious results may follow. The taking of food, then, serves a double purpose; it supplies the body with needed nourishment and at the same time furnishes the impulse needed to enable the body to get rid of the unusable residues of a previous meal and of a portion of its constantly accumulating intestinal excretions. So if regularity of bowel movement is to be expected, care to take the food at regular intervals becomes a matter of absolute importance. With the savage, regularity of bowel movement is not a matter of so great importance, for the reason that he is rarely so situated

that he cannot respond quickly to the "call" for evacuation. But civilized human beings by their systematic and, in general, their closely occupied life, must often find themselves in circumstances which compel a considerable delay in answering the "call" without being seriously incommoded. Rather than interrupt the normal rhythm, even on a single occasion, it would be better to incur a very considerable degree of inconvenience, a fact which the constipated must take to heart and carry in mind; but it is better to observe such an order of life and such regularity of habits as will cause the bowels to move at a time at which they may without haste or inconvenience receive the leisurely and thorough attention which the importance of this function demands.

Every meal must contain foods which will leave a sufficient amount of residue to prevent stagnation. To neglect this fact on a single occasion may, in the case of a constipated person, who by careful attention to regimen has established regular bowel habits, cause the beginning of a return of all the old conditions.

Too much emphasis cannot be laid upon the absolute and unfailing faithfulness required to maintain the improved condition which may have been attained. The majority of cases of constipation relapse sooner or later, but chiefly because patients return to their old irregular and careless habits. Drugs are resorted to because by their use the difficulty is temporarily overcome with so much less trouble and self-control than is needed for the complete regulation of one's habits of life, especially in relation to eating. Sufficient care in the matter of diet will be followed by success in nearly all cases of simple constipation. It is necessary, however, that the proper regimen should be strictly and uninterruptedly followed.

Supplementary Bowel Movements

The act of defecation must be made as complete as possible. The rectum and lower bowel are often filled with dry feces which are an obstacle, the removal of which by patient and continued effort may be followed by a full and natural movement,

Sometimes a partial movement will be followed by another, within a half hour or less. Many persons evacuate their bowels in the morning by two movements, one on rising and the other soon after breakfast. Whatever may be the vagaries of the individual colon, if it can be persuaded to act at all, other things must be accommodated to its need. In many cases, always when the movement seems less complete than usual, it is wise to give the bowels a second opportunity for movement a few minutes or half an hour later. If a second "call" is experienced, the matter should not be ignored, but should receive instant attention. The moving of the bowels is a matter of equal importance with the taking of meals, and should be given the same consideration. A crippled colon must be humored and coddled, so to speak, and in many cases apparently hopeless the colon may be trained back to habits of normal activity and regularity. It must not be expected, however, that this will be accomplished in a day or a few days. Many months of patient effort may be required.

Give the Colon Time for Action

A hurried visit to the toilet does not give the colon time for efficient action. Great haste may cause spastic contraction and prevent evacuation.

The colon is not completely filled with fecal matter except in cases in which the bowels move but once a day or less frequently so that there is an accumulation of food residues which completely fill and distend the gut. Under normal conditions the lower bowel or pelvic colon acts as a reservoir for the food residues which are ready for dismissal, and when this part of the intestine is filled and begins to overflow into the rectum, a reflex is set up which empties the pelvic colon. It sometimes happens that the whole left half of the colon is emptied by the same contraction that discharges the contents of the pelvic colon, but not infrequently the first evacuation only empties the pelvic colon, while at the same time starting a movement of material along the descending colon which a few minutes later reaches and again fills the pelvic colon and so leads to a second

evacuation. On this account sufficient time should be allowed at the toilet to permit the bowel to bring down a second or a third installment of fecal residues. The five or even ten minutes devoted to this purpose will be a good investment. When sufficient time is not given for complete evacuation, the retained fecal matters often become dry and impacted and the next evacuation will not occur at the proper time, and when it does occur may require straining and cause hemorrhoids or fissures which usually disappear when bowel movements are frequent, regular and of normal character.

Do Not Worry

Worry, or apprehension about the condition of the colon, or possible failure of evacuation, may become a serious cause of constipation. There is little room for doubt that depressing emotions have the effect to cause a strong spastic contraction of the descending colon which presents an almost impassable bar to evacuation. The movements of the colon, like those of the heart, stomach, liver and other vital organs, are normally auto-

matic. They cannot be controlled by the human will, of which they are altogether independent; but all these organs may be powerfully influenced by the imagination. Powerful emotions, fear, disappointment or even joy, may double the rate of the heart beat or even cause the heart to cease to beat. Anger, bad news, or even the memory of a disgusting sight or smell, may reverse the action of the stomach and cause vomiting.

One must keep on good terms with his waste disposal system if he expects it to operate efficiently, or at least he must avoid interference through obstructive mental activity. If one feels sure his bowels are not going to move they probably will not move; on the other hand, confidence and expectation added to a proper preparation by rational diet and other measures are the best assurance of normal functioning.

The psychologist eliminates the element of fear and establishes a healthful mental state by requiring his patient to rapidly repeat over and over some phrase such as "I am getting better and better every day in every way." There is no healing magic in these

phrases; they simply serve to establish a hopeful, expectant mental state which prevents the obstructive action of depressing emotions and thus permits the automatic mechanism to operate in a normal manner.

So the constipated person should not find fault with his colon and should refuse to entertain the idea that he is incurably constipated; but after making use of the rational measures recommended in this book should confidently expect the good results which he is practically certain to realize. To divert the mind from unpleasant memories and to insure giving the colon time for action it is a good plan to occupy the mind pleasantly while waiting at the toilet by reading a morning paper or some other entertaining literature.

When the colon has by careful management once become established in normal habits, the greatest care must be exercised to avoid interrupting the daily rhythm. A certain time must be set apart for evacuation and the hour must be religiously observed. Nothing should be permitted to delay immediate attention to the slightest "call." In

this way, very badly crippled colons have been restored to a very nearly normal condition. The colon must be treated with due respect and consideration. A little neglect will quickly bring back all the old miseries. Just one failure to evacuate at the usual hour, one meal without the proper amount of roughage, even the missing of a meal, or the omission of the very necessary lubricating oil, or neglect to keep the flora changed, may necessitate some days or weeks of most painstaking effort to reestablish normal regularity.

The Rational Treatment of Constipation

Many of the causes of constipation, and many of the influences connected with everyday life which tend to produce this condition, have been already discussed with some detail, and need not be reconsidered here. The bearing of each one of these causes should be considered in each individual case, and not one unfavorable influence should be permitted to remain.

Clothing

This has a very much more direct bearing upon the functions of the colon than might at first be supposed. Corsets and belts, as has already been shown, tend directly to produce constipation by hampering the movements of the diaphragm, preventing proper development and activity of the abdominal muscles, and causing displacement of the colon and other viscera into the lower portion of the abdomen. Excess of clothing tends in the same direction by overheating the body and producing excessive perspiration and relaxation of the muscular structures of the abdomen, and perhaps also of the intestines.

Proper clothing of the feet is a matter of no small importance. Chilling of the feet may cause spastic contraction of the descending colon and thus render the bowel incapable of promptly discharging its contents. The feet must be kept dry and warm. Shoes must be comfortable. Shoes which pinch the feet or cause flat foot, may make the colon spastic.

Sleep

The important relation of sleep to constipation is shown by the fact that loss of sleep, or a change of sleeping hours from night to day, very quickly upsets the bowel rhythm when it is nicely balanced in a person of sedentary habits. Cannon showed that the bowel contents advance very slowly during sleep, but very rapidly during and directly after eating. It is known, also, that sleep slows the movements of the stomach and intestine. Evidently sleeping after eating must tend to constipation by interfering with the normal advance of the colon contents toward the exit.

Loss of needed sleep does not, however, increase bowel activity, but rather has an opposite effect, doubtless because of its general depressing effects. This is shown in the lack of appetite and in the coating of the tongue which result from loss of sleep. Relish for food is one of the normal stimuli of the intestines. The increased nerve "tension" noted in persons who have been deprived of sleep, and especially in persons who suffer from inability to sleep, is manifested in many very

definite ways, one of which is a very pronounced contraction of the descending colon. The colon is often so firmly contracted as to be completely closed up, and it may be felt low down in the right side of the abdomen and rolled under the finger and gives an impression resembling that of a piece of firm rubber tubing.

Posture During Sleep

This is by no means a matter of no importance. Gravity exerts a decided influence upon the contents of the stomach and intestines in states of disease, although the influence of this force is of little moment in conditions of health. In health the food is grasped by the digestive tube as soon as it reaches the back of the throat, and this vital grip is maintained until the residue of the food is cast out at the anus.

In disease, the situation may be greatly changed. The walls of the stomach, instead of contracting upon the food and kneading it, may be relaxed and hanging loosely separated like the sides of a bag. The stomach no longer grips the food, and so gravitation

controls it to a large degree. Under these circumstances it is best for the patient to lie upon the right side in case a meal has been eaten within two or three hours before going to bed, or if there is evidence of the presence of food or liquid in the stomach on retiring.

When the cecum is known to be dilated and the seat of stagnation, it is well to sleep upon the left side, so as to facilitate the movement of food along the relaxed colon.

In cases in which the abdominal muscles are much relaxed and the whole colon dilated, so that intra-abdominal pressure is much reduced, it is well to lie upon the face, so that the weight of the body may by constant pressure upon the abdominal contents aid the progress of the feces along the crippled colon. Thin persons may often adopt with advantage the practice of sleeping on the face with a pillow beneath the abdomen. Backache, and various discomforts in the abdomen, especially in cases of colitis, may often be relieved by this simple procedure. Persons whose stomach and intestines are much relaxed and sluggish in consequence are much benefited by lying upon the

face for half an hour or an hour after each meal. This not only aids the passage of liquids from the stomach, but helps the colon, and prevents the excessive congestion of the viscera, which naturally results from the excitement of digestion when the intra-abdominal pressure is very low. The nervousness from which many dyspeptic and constipated persons suffer after eating may often be relieved and prevented by half an hour's rest lying upon the face after meals. It should be observed that it is not well to sleep long after eating, though a short nap, lying on the face, will do no harm and may encourage bowel action.

DIET IN CONSTIPATION

The writer once asked a celebrated Vienna professor, "What do you do for constipation?" The reply was, simply, "Diet." "But, professor, what do you do for cases in which diet and all other means have failed?" The reply was, "Diet, only diet." In explanation the professor added that more bulk was the thing most needful, adding more and more daily until the bowels were made to move.

Proper regulation of diet is certainly the most important of all measures to be adopted in the treatment of constipation, although there are other measures which are too valuable to be neglected. A practical cure may in many cases be effected by this means alone, provided, of course, that proper attention is given to ordinary bowel hygiene. No attempt should ever be made to treat a case of constipation without proper regulation of diet. Such a course, no matter how gratifying may be the results for the time being, must end in disaster; for a physiologic diet

is of all things most essential for securing normal action of the intestines.

First of all, the fact should be recognized that food is Nature's laxative. Natural food taken in the proper manner and at proper intervals gives to the alimentary canal just the kind and amount of stimulation that is required to maintain the normal procession of material along the digestive tract, and to effect the prompt discharge of unusable residues and poisonous wastes from the body. As has been pointed out in preceding chapters, one of the effects of eating is to set up in the stomach a series of vigorous peristaltic movements, which pass from the stomach along the whole length of the digestive tube. Under normal conditions these movements are sufficient to cause the fecal remains of a preceding meal to move down into the lower and discharging part of the colon, thus setting up the reflex actions which result in their evacuation. This statement is not based upon theory alone, but is founded upon careful observations by expert roentgenologists, made upon the stomach and intestines with the X-ray after the administration of the bismuth

meal. It also agrees with the every-day experience of normal persons. The natural time for the bowels to move is soon after eating, and under fully natural conditions a bowel movement occurs after each meal. The writer has met a number of persons whose intestines were so sensitive to the stimulation of food that the taking of food at any time, even in a small quantity, had the effect to produce within a few moments a call for evacuation. Cases are occasionally met in which the taking of food produces such strong stimulation that the patient finds it difficult to finish a meal without interruption by the demand of the bowels for evacuation.

In the dietetic treatment of constipation, it is necessary to understand the particular properties of food stuffs to which stimulation of the intestinal movements is due, and to make use of these several qualities as they may be required in individual cases.

The Laxative Properties of Foods

The properties of food stuffs to which a laxative influence is due may be briefly enumerated as follows:

1. Sapid qualities to which flavor or tastes are due.

2. Bulk, or rather the presence of cellulose, which is capable of forming an indigestible residue.

3. Moisture, that is, a necessary amount of liquid taken at meals or between meals, especially in connection with cellulose which by absorbing water holds it in the intestine.

4. Chemical properties which result from the presence of sugars and organic acids in the food, including the sugars formed by the digestion of starch, and the lactic acid formed by the fermentation of sugar in the intestine. Fats are also somewhat laxative.

In the regulation of the diet for the relief of constipation, the aim must be to make such selection of food stuffs as will furnish these various laxative properties in the measure required by the individual case. This is by no means a simple matter, and requires, first, a very thorough knowledge of food values and second, a most thoroughgoing investigation of each individual case, so that not only the particular form of constipation from which he is suffering may be fully known, but also at

what point or points in the intestinal track the delay occurs, and the cause of the delay. The force of this statement will be fully appreciated if the chapter on "Causes of Constipation" has been read with care.

Atoxic and Antitoxic Properties of Foods

In addition to the laxative properties of food stuffs, there is another quality of equal importance, which must be duly considered in the treatment of constipation, because of the prolonged stay of undigested food remnants and body wastes in the food canal and of the tendency to delay which will always remain, even under the best conditions which can be supplied. It is of the highest importance that the food should be of such a character as to prevent as far as possible the putrefactive changes which are always increased, and often to an extraordinary degree, whenever there is delay.

Of the three essential food elements, carbohydrates (starch, sugars and organic acids), fats, and proteins, the last named only is capable of undergoing putrefaction. Foods rich in starch and sugar do not undergo putrefac-

tion, either outside the body or within the intestine, and hence, are properly termed atoxic foods.

Fats in excess encourage putrefaction, while starch and sugar in excess produce the opposite effect. By the fermentation of starch and sugar in the intestine, acids are formed, which, as has already been pointed out, by interfering with the growth of putrefactive bacteria, prevent putrefaction. Fats ferment, when taken to excess, forming butyric acid, an irritant poison.

Fruits, starch in vegetables like the potato, and green vegetables of all sorts, which contain little or almost no protein, together with certain sugars, especially milk sugar, maltose or malt sugar, and the sugar of fruits, and to a less degree cereals, particularly rice, which are very rich in starch, are not only atoxic, being incapable of putrefactive changes, but are also highly antitoxic, since they in a high degree promote the formation of acids in the intestine.

Antitoxic Value of Uncooked Foods

A most important point in connection with this subject, which appears to have been overlooked by writers on dietetics, is the antitoxic value of uncooked foods. Man is the only "cooking animal." To primitive man cookery was not only unknown, but was as unnecessary as for any other member of the animal kingdom. The only really valuable purpose served by cookery is to enable man to make use of dried grains and certain coarse vegetables, which would otherwise be unavailable as food. Experience has proved that food is often by cookery deprived of certain elements which are essential to human nutrition. The argument made by certain faddists who advocate the exclusive use of a raw diet, that by cookery the life principle is driven out of the food so that its nutritional value is lost, has no scientific basis; nevertheless, it is true that cookery destroys the life of the cells of vegetable foods, and in so doing, deprives the food of certain properties which are useful in the intestine. Living cells resist the attacks of the microbes which produce fermen-

tation and putrefaction. A raw apple or potato remains intact for months, while a cooked apple or potato is in a few days covered with mold, and is in an active state of fermentation and destructive change.

In the light of modern researches it appears that the chief advantage gained in the use of raw food is due to the fact that cooking greatly injures or destroys the anti-scorbutic vitamin which is essential to good nutrition. Much chronic illness is due to this cause. There is reason for believing that this vitamin aids bowel action (McCarrison). In its absence constipation and autointoxication are very pronounced.

An experiment made by the writer some years ago gave very positive evidence of this fact. Two equal portions of cabbage were taken. One portion was cooked. Both portions were then inoculated with equal quantities of putrefactive bacteria, by mixing with each a portion of fecal matter. The two portions of cabbage were then placed for twenty-four hours in an incubator in which the temperature of the body was maintained. Examination showed that the bacteria in the cooked

cabbage had increased enormously in numbers, whereas in the uncooked cabbage the number of bacteria had not increased, but had actually diminished.

Many persons have thought themselves benefited by the use of raw grains, such as wheat and oatmeal. While it would be impossible for a person to live on a diet consisting exclusively of raw grains, it is possible that some benefit may be derived from the use of such food to a moderate extent, through the fact that uncooked starch digests slowly. Cooked starch, as well as sugar and other carbohydrates, is normally wholly absorbed in the small intestine, or practically so, and therefore furnishes no resistance to the growth of bacteria; but raw starch, if taken in more than minute quantities, as the writer has shown by experiment, finds its way in considerable quantities into the colon. Here, digestion slowly proceeds, producing dextrin and sugar, which furnish to the acid-forming bacteria just what they require for their growth in a section of the intestine where the help of these friendly organisms is most needed. Man's natural dietary comprises food

containing a sufficient amount of raw starch to prevent extensive putrefaction in the colon; and therefore the art of cookery, while essential under the conditions of modern civilization, is not altogether free from disadvantages, which, however, may easily be obviated by a proper selection of foods or, in special cases, by including in the ordinary bill of fare partially cooked foods containing a certain portion of uncooked starch such as oatmeal or other grains cooked six to ten minutes.

Fruits are the most highly antitoxic of all food stuffs. They possess in a high degree all the antitoxic properties of food.

They are most acceptable in an uncooked state, both to the palate and to the digestive organs. They are completely prepared for human sustenance in the great laboratory of Nature "cooked in the sun," as they say in Mexico. "Cocido en el sol?" asked a native fruit seller of the writer, who was seeking to purchase some tropical fruit in the market place of a town in Old Mexico.

With very rare exceptions, fruits contain a considerable amount of organic acids—citric,

malic or tartaric,—all of which possess antitoxic properties. Even many sweet fruits contain a considerable amount of these acids, which are disguised by the sugar, but which are not neutralized or destroyed by it.

The sugars of fruits promote to a high degree the growth of acid-forming bacteria in the intestine, and thus lead to the formation of lactic acid, which, like the acids of fruits, is antitoxic.

The antitoxic properties of fruits, though not understood until revealed by bacteriological researches of recent years, have long been utilized in a practical way in what is known as the fruit cure, the value of which in the treatment of chronic bowel disorders has been well understood for centuries. The grape cure of Switzerland and certain parts of Germany, the cherry cure advocated by Linnæus, the great botanist, and similar "cures" through the use of apples, peaches, and other fruits, practised in several countries, owe their value to the antitoxic properties of these choicest of Nature's products.

The Antitoxic Laxative Diet

Every constipated person, then, requires a bill of fare consisting of antitoxic and laxative foods. It is most essential that his diet should eliminate flesh foods of all sorts, including fish, oysters, fowl, as well as beefsteaks, chops, and other red meats. In many cases it is also wise to avoid eggs or at least to use them very sparingly. Many persons find themselves able to use the yolks of eggs, who cannot take the whites either cooked or raw without suffering inconvenience, because of the readiness with which this form of albumin undergoes putrefaction in the intestine. When whole eggs are freely eaten, especially if hard boiled or poached, or in the form of an omelette, portions of undigested albumin may always be found in the stools, and in a state of very advanced putrefaction.

Those who have been accustomed to the free use of meat and eggs are sometimes afraid to dispense with them lest they should suffer from an insufficient supply of protein; but the experiments of Chittenden and the extensive practical experience of the Battle

Creek Sanitarium have shown most conclusively that the protein requirements of the body may be fully supplied by a diet from which meat is wholly excluded, and even eggs may be dispensed with if half a pint or a pint of milk is used daily in connection with other foods consisting exclusively of fruits, grains, and vegetables. The sufficiency of a diet of this sort has been definitely proven by the experiments of Sherman, of Columbia University, on both animals and human beings. It is even possible to arrange an adequate bill of fare with the exclusion of milk provided nuts are freely used.

Peanuts, walnuts and almonds are rich in protein; a pound of pine nuts, in fact, contains 50 per cent more protein than a pound of lean beef, and besides, contains twice as much more nutrient in the form of a most easily digestible fat. Practically the same thing may be said of almonds and peanuts. Any possible deficiency in protein may readily be made up by taking at meals a handful of any kind of nut meats. It is highly important to remember that nuts must be very thoroughly masticated, so that the protein

present may be easily accessible to the digestive juices.

Meats are constipating, first, because when digested they leave but a small amount of residue. The bulk of the food residues is several times as great with a vegetable diet as when the diet consists largely of meats, eggs, and milk. A second reason for the constipating effect of meat is the infection of the colon with putrefactive bacteria always found in butcher's meat, as well as in dried and salted meats, and the toxic effect of the ammonia and other putrefaction products which paralyze the colon.

Cellulose-Containing Foods

All vegetable foods contain more or less cellulose, but the amount differs very greatly. This element, as has already been mentioned, is highly necessary as a means of securing normal bowel action. Indeed, bulk, not simply in the food itself, but in the residues left behind after the absorption of the nutritive portions of the food, is of first importance. This quality in food is even more important than the antiseptic properties, for the

reason that putrefactive bacteria may always find in the bile and other intestinal secretions abundant material to support their growth, provided sufficient delay occurs to encourage putrefactive changes.

Sterilized Wheat Bran

One of the oldest and certainly the most valuable remedy in the treatment of constipation is ordinary wheat bran. Bran consists largely of cellulose in an indigestible form, and is passed through the intestine without difficulty. The apprehension which some authors have expressed concerning the irritating effects of bran are wholly without basis, except, of course, that one would not think of using bran in a case of acute inflammation of the stomach or intestines. As a matter of fact, when well softened with water, bran is no longer irritating, but is an emollient. The thin films of cellulose become as soft and pliable as wet paper, and excite the bowel, not by scratching or irritating it, but by a gentle titillation and by giving to the food sufficient mass to distend the intestine and stimulate it to vigorous activity. The cellulose and cork

layers of bran absorb water with avidity and hold it, thus keeping the feces soft.

To be efficient, the particles of bran must be coarse. A large part of ordinary bran is made up of dirt, dust, germs, starch, and fine bran, all of which have little or no laxative properties. A large flake of bran in the mouth will keep the tongue busy until it is removed. If the same bit of bran were ground into small particles its presence in the mouth would not be noticed, and the tongue would not be excited to action. The same is true of the stomach and intestine. Only the very coarsest bran is efficient. The same is true of agar and other forms of roughage. This was first pointed out for agar by Professor Ad. Schmidt, and was proven with reference to bran by the writer some years ago. So-called bran flakes contain only about half as much cellulose as do ordinary bran and this is broken up into such fine particles by the process of flaking that it has little or no laxative value.

In its ordinary commercial form, bran is scarcely fit for use, on account of the large amount of dirt which it contains, including

multitudes of bacteria. For intestinal use as a laxative, it should be carefully prepared by thorough cleaning and washing of the wheat before grinding and sterilization after milling. Sterilized bran, first introduced by the writer nearly twenty years ago, is now prepared by various manufacturers, and is put up in convenient packages. One or two rounded tablespoonfuls should be taken at each meal, the amount depending upon the character of other foods taken. The writer has never seen any ill effects from the use of sterilized bran, which he has prescribed for many years, although there are cases in which it fails to produce the desired effect and has to be supplemented by the use of paraffin oil as a lubricant.

This is particularly true in cases in which the cecum is greatly dilated or crippled by adhesions and in cases in which there is obstruction of other parts of the colon, especially the pelvic colon as the result of adhesions.

The combination of paraffin oil with bran or agar-agar in some form is also useful in cases of spastic contraction due to colitis.

Experience shows that from an ounce to two ounces of bran must be taken with the food daily, to insure sufficient bulk to stimulate the intestine to action. In cases in which the colon is very redundant or is crippled by adhesions, even a larger amount may sometimes be needed, at least until the bowel has been trained to normal action. This amount of cellulose is provided by two rounded tablespoonfuls of sterilized bran in addition to other laxative foods at each meal.

The amount of food required to furnish an ounce of cellulose may be ascertained by reference to the foregoing tables.

It should further be mentioned that in the use of cellulose in concentrated form as in sterilized bran, the whole amount used at a meal should not be taken at once, as at the beginning or end of the meal, but should be well mixed with the food by taking small portions at frequent intervals during the meal.

Agar-Agar

The use of agar-agar, a Japanese sea-weed of a nature similar to Iceland moss, is to be most highly recommended as a means of giv-

ing the necessary bulk to stimulate the intestine to prompt action.

It may be used without any possible injury in all cases of sluggish bowel action. When properly prepared it is wholly free from unpleasant flavor, and it manifests such astonishing avidity for water that when it is present in the feces they cannot possibly become dry and hard.

In cases in which constipation is due to "greedy colon," agar-agar or bran is indispensable. In such cases the colon has acquired the power to eat up enormous quantities of the cellulose of the food, so that it is very difficult to increase the bulk of the feces by the use of green vegetables. This is the reason for the disappointment experienced by many who hope to find in the free use of lettuce and the like green foods a panacea for their intestinal ills. Agar-agar is hemi-cellulose, and has been shown by the experiments of Mendel and others to be indigestible by any of the digestive fluids with which it comes in contact in the human body. Agar-agar must be taken in sufficient quantity to accomplish the object sought. Two-thirds of



Crude Agar



Agar in Sterilized and Edible Form

an ounce to an ounce is the quantity usually required for adults. For young children a quarter to a half of this quantity is sufficient.

Agar-agar is easily taken in soup, cereal coffee, fruit juice or stewed fruit. It should be allowed to soften and should then be swallowed without chewing.

This remedy should be taken at meals in order that it may be well intermingled with the food, and so prevent the formation of hardened residues in the intestine.

Agar-agar may be used with advantage as a substitute for a meal, when food cannot be taken, and when there is no appetite for food, and when so used it maintains the intestinal rhythm which would otherwise be lost, resulting in constipation. It should in such cases be taken with fruit juice or fresh or stewed fruit. When one finds at night that the usual amount of food has not been taken, an extra dose of agar-agar with a little fruit may be taken before going to bed. No digestive work is required by either the fruit or the agar-agar except to move it along the digestive canal.

Number and Size of Meals

In very many cases of chronic constipation the colon, especially the cecum, has become so dilated that it is seriously crippled. Its thin, atrophied walls are unable to handle large masses of material. In such cases, large bulky meals are likely to overweight the cecum and to form an impaction which may remain for days, giving rise to fermentation, distention of the colon with gas, colic pains, and great inconvenience. Complaint is often made that bulky foods cause much flatulence and distress and seem to increase the constipation. The remedy is not to be found in discarding "coarse vegetables" or other bulky foods but in taking smaller and more frequent meals. By this means the amount of material present in any portion of the bowel at any particular time will be reduced, the bowel will never be over distended, and will have an opportunity gradually to recover its normal tone.

The proper plan for the meals in such a case is to take two principal meals and two minor meals. The principal meals should

contain the chief part of the nutriment; the minor meals should make small demands upon the digestive organs; the bulk should be about the same for each of the four meals. No fats should be taken at the minor meals and nothing requiring more than two hours for gastric digestion. It is best to confine the minor meals to fruit and roughage (bran or agar in some form).

The cellulose may be taken in the form of bran mush, bran cakes, colax, (Japanese sea weed or Ceylon moss), or laxa, (sterilized bran and agar-agar). Any sort of fresh juicy fruit may be eaten, but bananas, dates, dried figs and raisins should be avoided. Fresh figs or raw soaked purple figs are excellent. Soaked raw prunes are also very good indeed.

The arrangement of the four meals as regards time may be the following: first, breakfast on rising, say 6:30 a. m., fruit and bran; second breakfast, 9:00 a. m.; dinner 3:00 p. m.; fruit lunch at bedtime. If these hours are not convenient, some other arrangement may be made, care being taken to avoid taking meals too near together.

The Use of Bran

Wheat bran is perhaps the most useful of all food remedies for constipation. Bran may be taken by itself or it may be used in many combinations. Care must be taken to obtain clean bran, which is not always easy, for the reason that the bran is usually mixed with much dirt and offal removed from the grain. To be fit for use, the bran should be taken from wheat which has been specially cleansed and washed. The bran should be cooked and sterilized to destroy any adhering germs.

Such bran only needs softening and is ready for immediate use. It may be eaten as a breakfast cereal or it may be mixed with any other suitable food such as oatmeal, toasted flakes, or even mashed potatoes or boiled rice.

Sterilized bran may be added to bread, biscuit, cake and breakfast cakes in proportion of one-fourth or even more. It should be used freely at every meal. Numerous excellent recipes are now available for using bran in various palatable and efficient ways.

Recipes for the Use of Bran

BRAN AND OATS

- 1 cup rolled oats
- 1 cup sterilized bran
- 2½ cups water
- 1 teaspoon salt

Heat the water to boiling. Add the salt, bran and the rolled oats. Let boil five minutes. This dish is a good corrective measure and at the same time an excellent breakfast food.

STERILIZED BRAN

Look over and remove foreign substances from bran and place in a rather shallow pan in a moderate oven. Place a pan of hot water in the oven to prevent burning. Bake a half hour, stirring the bran often to prevent scorching. Grind in a coffee mill.

BRAN AND GRANOLA MUSH

- 1 cup sterilized bran
- 1 cup granola
- 3 cups water
- 1½ teaspoons salt.

Mix the bran, granola and salt. Stir into the boiling water and cook for a few minutes directly over the flame.

GRAHAM BREAD

3 cups milk and water (equal parts)
2 tablespoons malt honey or molasses
1½ cups sterilized bran
About 2 quarts whole wheat flour
2 teaspoons salt
½ yeast cake
¼ cup warm water

Soak the yeast in the warm water. Scald the milk and cool to lukewarm. Potato water may be used instead of the milk and water. Add water, the molasses and salt, then the softened yeast. Mix the flour and bran together and stir into the liquids. Knead thoroughly, and put to rise in a warm place. When light, mold into a loaf. Let rise again, and when light bake in a hot oven about one hour. Decrease the heat somewhat during the latter part of the baking. This makes 3 small or 2 large loaves. Graham flour may be used instead of the whole wheat, in which case less bran will be needed.

BRAN BISCUIT

- 1 cup sterilized bran
- 2 cups graham flour
- 1 cup milk
- 1 egg
- 2 teaspoons sugar
- 1 teaspoon salt
- 2 tablespoons butter
- 1 teaspoon soda

80 minims hydrochloric acid— (C. P.)
(This amount of soda and hydrochloric acid is equivalent to 4 teaspoons baking powder.)

Mix the flour, bran, sugar, and salt together. Beat the egg slightly and add to the milk. Dissolve the soda in the milk, and add the melted butter. Lastly, add the hydrochloric acid. Turn very quickly into the dry ingredients. Mix lightly but quickly. Turn upon a molding board, shape with a biscuit cutter and bake fifteen to twenty minutes in a hot oven.

If baking powder is used, omit the hydrochloric acid and the soda, and proceed as follows: Mix the dry ingredients together, beat the egg slightly and add to the milk. Stir

the liquids into the dry ingredients the same as for cream biscuits. Turn out upon a slightly floured molding board and roll to one-half inch in thickness. Cut into shape with the biscuit cutter and bake in a hot oven.

BRAN GEMS

1 cup sterilized bran

1 cup graham flour

$\frac{7}{8}$ cup milk

3 tablespoons melted butter

1 teaspoon salt

1 egg

1 tablespoon sugar

$\frac{3}{4}$ teaspoons soda

60 minims hydrochloric acid (C. P.)

(This amount of soda and hydrochloric acid is equivalent to 3 teaspoons of baking powder.)

Mix the bran, flour, salt and sugar together. Beat the egg, add the milk and one-half of the dry ingredients. Stir in the hydrochloric acid. Mix well and add the melted butter. Sift the soda with the remaining half of the dry ingredients and stir into

the batter. Turn into buttered muffin pans and bake in a hot oven twenty to thirty minutes.

Laxative Breakfast Foods

The average individual finds the use of bran at every meal something of a task, and, indeed, may find it very difficult to persevere in the practice. On this account it is desirable that roughage should be presented in different forms. Probably bran is on the whole the most efficient form of roughage. It acts not by irritation but by titillation or contact stimulation. To be effective, however, the particles of bran must be in their natural state, and the larger the better. Bran that has been milled or processed in such a way as to lessen the size of the particles has little or no efficiency. A large particle of bran placed in the mouth will keep the tongue busy until it is located and removed. There is no irritation produced, only a gentle excitation to activity until the foreign body has been disposed of. The stomach, intestine and colon behave in a like manner. If the same particle of bran were divided into twenty pieces, these fine particles might remain in

the mouth, stomach or any other part of the intestine for a long time without being noticed. They would produce no reflex activity. Bran in this form is merely dust and the number of nerves with which each particle comes in contact is too small to provoke a reflex action.

Scarcely more than a third of the particles of ordinary bran are large enough to produce a marked laxative effect. For this reason much of the bran and many of the numerous bran products now offered on the market are of very little service. Many persons become discouraged in the use of bran because of this. Only specially prepared bran in which the finer portion has been removed and products of which this carefully selected bran is the basis can be relied upon to produce laxative effects. Fortunately, a number of such products are now available. In addition to the original sterilized bran first prepared and used at the Battle Creek Sanitarium and known as Sanitarium Bran, two other efficient products which conform to the above specifications are now available,—Vita-Bits, a granular ready-to-eat food which contains two parts of

bran by measure to one of other ingredients, and Branola, a partially cooked breakfast cereal which consists of the outer covering of the wheat berry together with the adjacent gluten layer, an exceedingly palatable breakfast cereal. Brose, Vita-Bits, Branola, Laxa and Sanitarium Bran, with figs, dates, prunes, and other fruits, greens and fresh vegetables, furnish a sufficient variety of efficient laxative preparations to serve all practical purposes. Of course all whole grain preparations such as shredded wheat, oatmeal, graham bread, cracked and whole wheat and bran in every form, are wholesome and more or less useful sources of roughage; but in flaked cereals the bran is so broken up as to render little service.

There are now many laxative foods offered for sale by grocers and advertised in newspapers, most of which have more or less value, although differing considerably in efficiency. In general, all pure bran preparations are efficient. Bran biscuit, crackers and cookies and so-called whole wheat bread and crackers are inefficient because the amount of bran they contain is too small to furnish the

required bulk. Bran must be used in a large way to produce results. A teaspoonful or two of bran renders little or no service. Large amounts, one to three heaping dessert spoonfuls are required, and must be taken at every meal.

The following laxative foods were first prepared for use at the Battle Creek Sanitarium and their efficiency is there daily demonstrated in practical use:

Sanitarium Sterilized Bran. Prepared from carefully cleaned wheat. Large flakes. Excellent flavor. Ready to serve. Much more efficient than ordinary bran of which fully two-thirds is excluded in the preparation of this product which is the original sterilized bran.

Brose. A combination of bran with oats and corn. Slightly parched. Cooks in ten minutes. An excellent laxative, especially for children. Rich in vitamin B and food iron.

Sanitarium Bran Flakes. (Vitamized)
The most agreeable of all bran preparations,

* All the foods described were developed for the Battle Creek Sanitarium in the laboratories of the Battle Creek Food Company of Battle Creek, Mich., U.S.A

but less efficient than the coarser particles of Sanitarium Sterilized Bran. Rich in food iron and vitamin B.

Laxa. An agreeable combination of bran and agar in biscuit form. Crisp and tasty. The most highly efficient of all forms of roughage. Very convenient for travelers.

Fig Marmalade. A toothsome sweet prepared from purple figs and malt sugar. Contains no cane sugar, and hence may be eaten freely. Highly laxative. A similar marmalade is prepared from prunes.

Malt Sugar (Maltose-dextrin). A sugar (maltose-dextrine) prepared by the diastatic digestion of starch. In syrup or powder form. Rich in food lime and iron which are wholly lacking in cane sugar. Decidedly laxative for infants. Slightly laxative for adults. A very agreeable flavor. Should be used instead of cane sugar.

Paramels. A mineral oil in solid form which melts at body temperature. An accessory preparation which supplies lubrication and so facilitates the disposal of residues and wastes. Is very often needed in addition to roughage foods. In tablet form. One is taken at each meal.

Diabetic Bran. Sanitarium Sterilized Bran from which the starch has been wholly removed by a digesting process. The bran is first cooked, then digested with diastase until all the starch is changed to dextrin and so made soluble. Washing several times then removes the starch almost to the very last trace. The amount left is so small as to be negligible. Only a small part of the starch can be removed even by the most thorough washing unless the starch is first rendered soluble by conversion into sugar and dextrin.

Branola. The most laxative of breakfast cereals. It consists of the outer covering of the grain with the adhering layer of gluten cells and comprises the choicest parts of the grain, including the iron, lime and vitamin (B). Branola has all the virtues of the whole wheat and in increased proportions. Slightly parched. Cooks in ten or fifteen minutes.

BATHS AND OTHER HOME TREATMENTS FOR CONSTIPATION

Water may render great service in constipation through the general improvement in health which may be secured by its systematic use. Cold water is of the greatest service. The short spinal douche is one of the most effective means which can be employed for improving the tone of the nervous system.

The inactive skin, due to the general saturation of the body with toxins, is an indication for sweating baths. In constipation these should be made short, however, barely long enough to stimulate the skin to vigorous perspiration, and should be immediately followed by a short general cold application, including a cold douche to the spine, abdomen and legs. Short, cold applications applied to the surface cause reflex contraction of the internal involuntary muscles. It is for this reason that placing the feet, sometimes even the hands, in cold water will often produce a desire to empty the bladder, through stimulation of the urinary center.

The defecating center and intestinal muscles may be stimulated in the same way. Various local applications are of great service in improving the tone of the bowels, though local cold applications must be used with great discretion and with careful knowledge of the exact nature of the case; for the tendency of cold to produce contraction of the involuntary muscles leads to an aggravation of the condition in colitis with spastic constipation.

Of the many different modes of applying cold water, which may be of service, the following are especially recommended:

The Cold Douche

A short cold douche to the lower part of the back, buttocks, abdomen and feet. The temperature should be 70° to 50° F., and the duration ten to thirty seconds. With patients who are not accustomed to applications of cold water, the temperature of the douches should at first not be lower than 70°. This should be gradually lowered at each application until the temperature of 60° to 50° is reached. In general, the douche should be

preceded by a short hot bath to prepare the patient for the cold application, and to secure prompt reaction, which is still further encouraged by exercise after the bath.

The Simultaneous Hot and Cold Douche

A very excellent form of bath especially adapted to cases of constipation, is the simultaneous warm shower bath (100° F.), with short cold douche to the abdomen. The warm shower bath should be applied for half a minute so that the skin will be thoroughly warm first, and the cold spray or broken jet should be applied to the abdomen without interrupting the warm shower. The temperature of the spray should be 70° to 50°. The duration of the cold application should be not more than a minute. At the end of the bath a short, general, cold application lasting no more than ten to fifteen seconds should be made to secure reaction, and thus fix the blood in the skin.

Abdominal Douche

When a douche apparatus is not available, a very efficient abdominal douche may be applied in an ordinary bath tub. A hot bath at the temperature of 102° to 103° should be applied for one to three minutes. Then the outlet should be opened and cold water should be poured on the abdomen while the water is running out. By lifting the dipper to the height of five or six feet a sufficient degree of force may be obtained to produce a decided reflex effect. The temperature of the water may vary from 60° to ice cold, the temperature being gradually lowered as the patient becomes accustomed to the cold application.

Hot Sitz and Cold Pour

The patient sits in water at a temperature of 102° or 103° for two or three minutes, then leans back in the tub while the attendant pours cold water 70° to 50° over the abdomen for half a minute.

Rubbing Cold Sitz Bath

In this bath the patient sits in water at a temperature of 75° to 55° for two minutes, rubbing himself vigorously meanwhile. This bath produces a powerful reflex influence upon the intestines, especially in the colon, and is frequently followed soon after by a desire to defecate. The patient should rub himself continually during the bath, and the feet may be kept in hot water if there is a tendency to chilliness. The shoulders should be covered by a woolen blanket.

The Sedative Sitz Bath

A bath at a temperature of from 60° to 70° for fifteen to twenty minutes produces powerful and prolonged contraction of internal muscular structures. This bath is useful in diarrhea, and is one of the most efficient means of improving the tone of the abdominal muscles and of an atonic colon. This bath should not be given in cases of spastic constipation. In general, prolonged cold baths of any sort, (that is, baths longer

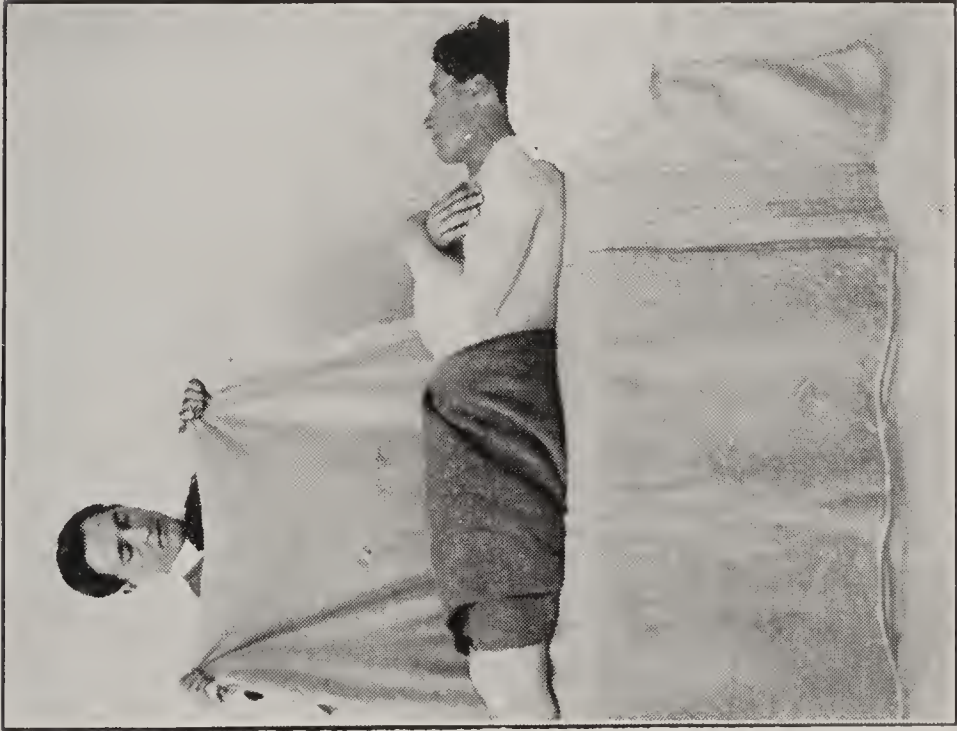
than two or three minutes), are aggravating in this condition.

Alternate Applications to the Abdomen

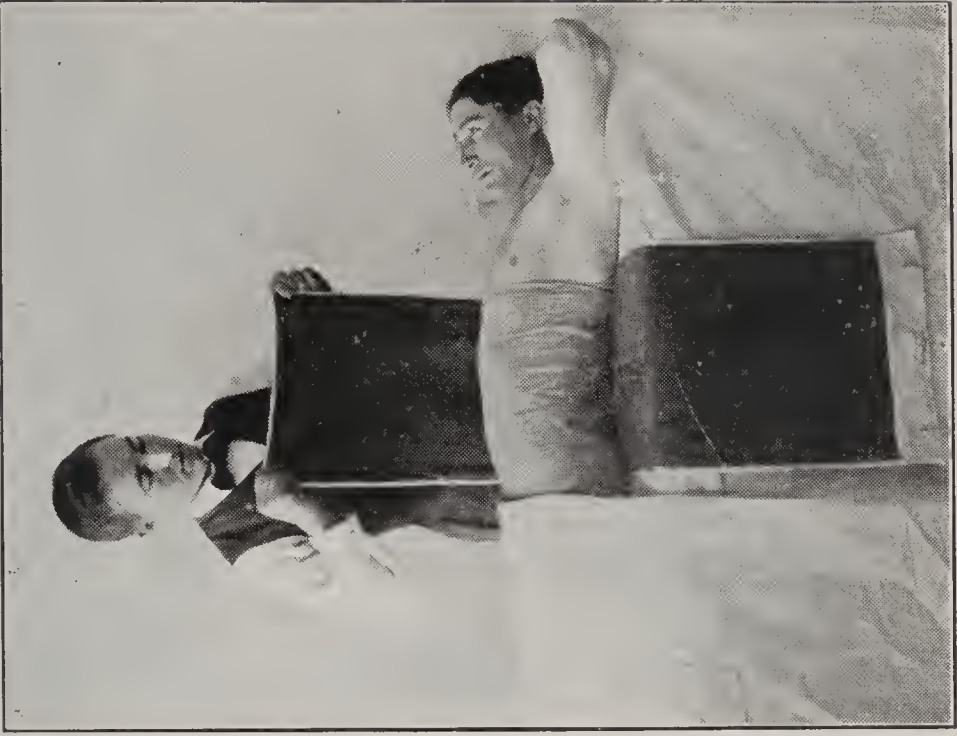
A hot fomentation to the abdomen for five to ten minutes, followed by a cold application for one minute, is an excellent means of stimulating peristalsis and improving the muscular tone. The cold application may consist of a compress of ice water, but the most effective method is to rub the abdomen with a smooth piece of ice. The effect of this application is increased by repeating the alternation two or three times in succession.

The Wet Girdle

This is a simple method which has been used for centuries by the peasantry of Europe. The abdominal girdle consists of a coarse towel of three yards in length, half of which is wet, the other half remaining dry. Beginning with the wet end, the towel is wound round the trunk of the body, great care being taken to see that it fits the skin snugly. Outside the towel a flannel bandage



Fomentation



Wet Girdle



The Photophore



The Thermophore

is applied. The towel should be changed before it becomes dry. It should be worn night and day to secure the most pronounced effect. The mackintosh or oiled muslin, often applied with the moist bandage, should be omitted when it is the purpose to relieve constipation.

Fomentation to the Abdomen

The abdominal fomentation is a capital means for use in spastic constipation, the result of colitis, and when the ileocecal valve is in a state of spasmodic contraction due to chronic appendicitis or ovarian disease. In general the fomentation is highly useful in all cases of constipation accompanied by pain in the abdomen, no matter what the cause.

The electric fomentation heater is a convenient means of heating a fomentation compress.

The best time for applying the fomentation is soon after breakfast, or shortly before the regular time for moving the bowels. Applications may be made with great advantage two or three times daily, or at least morning

and night, so as to relax the colon several times during the day.

In very pronounced cases of colitis, with spastic constipation, a short very hot bath is of great service. The duration of the bath should not be more than two to four minutes. It produces debility and anemia if long continued and often repeated. The effect of hot applications is to lessen the irritability of the nerve centers, and thus to relieve the intestinal spasm which may be due to congestion or inflammation of the appendix, ovaries, bladder, rectum or gall-bladder, or still more often, to colitis.

Combined Hot Bath and Hot Douche

Perhaps the most effective measure for the relief of intestinal spasms, such as sometimes occur in muco-membranous colitis, is a warm bath (100° F.) combined with a very hot spray to the abdomen. The water should be allowed to fall on the abdomen in very fine streams with very little force, at a temperature of 115° to 120° F. The duration of the application should be two to five minutes. It should

be followed by a cold application at a temperature about 80° for one or two minutes.

The Hot Sitz

The hot sitz bath at a temperature of 112° to 118° F., duration two to three minutes, cannot be too highly praised as a measure of the highest value for use in the treatment of reflex and spastic constipation, with or without colitis. After the sitz no cold application is made. The best time for the bath is on rising in the morning.

The Photophore, and the Electric Thermophore

These are measures of great value in the treatment of spastic and reflex constipation, and are especially useful in cases in which pain is a pronounced symptom and a cause of reflex spasm. The applications should be made morning and night in place of the fomentation, and are much more effective.

The Enema

This most useful means of treatment, the enema, is one of the most abused of all measures employed to combat constipation. It cannot be said to have done as much harm as has been done by laxative drugs and mineral waters, but not a little harm has resulted from its abuse, although when properly used it is one of the most harmless of measures.

According to Pliny, the first writer on natural history, the use of the enema was learned by the ancients from the stork which was "observed to inject water into its bowels by means of its long beak." It is now known, however, that this was an error of observation. The stork does not inject water into its colon, and probably has no occasion to seek relief in this way. The great bird, like many other feathered creatures, has near the anal region an oil secreting structure known as the preen gland. What Pliny saw was the stork oiling its beak in preparation for preening its feathers.

But the use of the enema has been known from the most ancient times and is employed

by the most primitive tribes. The native of the Congo administers an enema to himself by lying down upon the ground and inserting into the rectum the perforated lip of a bison's horn filled with water from a nearby stream. The modern enema syringe was devised about the time of the discovery of America by Columbus.

Within a century the enema came into such honor that the physician who attended Louis XIII thought it worth while to record the exact number of enemas administered to the king (220) during the last six months of his life.

During the succeeding reign, that of Louis XIV, the enema became almost a rage in Paris. The court ladies and dudes discovered that by keeping the colon clean the complexion was improved and so it became the fashion to take several enemas daily to keep the skin white and the complexion fresh. This was a shrewd observation, for the reason that the same thing that keeps the complexion fresh also keeps the liver, kidneys, heart and other vital organs free from the destructive influence of poisons and keeps the mind

young. Here is a hint to modern beauties who desire to preserve their good looks. A clean colon is worth for this purpose a ton of cosmetics.

The damaging influence of colon poisons upon the mind is not a modern discovery. It is recorded that Voltaire was at one time so despondent that he remarked to a friend that he had resolved to hang himself. The friend called next day, anxious to know what had happened, and was delighted to find that a complete revolution had taken place over night. Voltaire met him with a smile and the simple explanation, "I have been well washed out."

Twenty-five or thirty years ago a New York charlatan made a fortune by selling what he termed "Hall's Secret," which consisted of nothing more than a small pamphlet in which instruction was given about the use of the enema for which a charge of \$4.00 was made. Large numbers of persons testified to the rejuvenating effects of this simple treatment which doubtless did some good, although many were injured by the large amount of water advised. "Hall" asserted

that he regularly made use of one gallon of water to fill and wash out his colon.

The enema is still being exploited by charlatans in various ways, but is prescribed less often than it should be by medical practitioners. Soon after the enema became so extraordinarily popular in the time of Louis XIV, the doctors turned this remedy over to the pharmacists, who later turned it over to the barbers, who at that time combined with their tonsorial duties cupping, bleeding, leeching and minor surgery in addition to the giving of enemas and sundry other medical "chores."

The only harm which results from the use of the enema is due to over-distention of the colon by the use of too large an amount of water. The amount should not exceed two quarts. For greatest efficiency, the water should be introduced slowly, and little force should be used. The temperature of the water should be generally about 85°F. When colitis or a spastic condition is present, the hot enema (102° to 105° F.) should be used. When the rectum is dilated or inactive, that is, in cases of rectal constipation, when the

“call” is lost, the temperature employed should be about 80° F. or even less. A small cool enema (pint or half-pint) should be used after the last enema and is highly useful as a means of stimulating a sluggish colon. It is well to introduce into the rectum a pint or half-pint of lukewarm water at bedtime to be retained over night in cases in which the stools are dry and hard.

When the enema is not promptly discharged, the juice of one or two lemons should be added to the water to stimulate peristalsis.

Irritation of the anus and sometimes hemorrhoids results from the frequent use of the enema. This may be prevented by lubricating the enema tube with carbolated vaseline and by the application of carbolated vaseline to the anal canal after each bowel movement.

When used in the manner above indicated, the enema may be employed for months or even years without injury. The daily use of the enema is greatly preferable to the retention in the colon of putrid fecal matters even for a few hours.

The use of an enema at night to empty the

colon does not interfere with the natural morning bowel movement, but encourages it. An enema at night often relieves insomnia by getting rid of troublesome gas and preventing the absorption of nerve-disturbing poisons.

How to Administer the Enema

There are unquestionably certain cases in which the colon has become so crippled by inflammations, stretchings, distortions, adhesions, and the degeneration of its muscular structures, and consequent weakening of its contractile powers, that it can no longer be made to perform its functions, even by the use of accessories which act as mechanical or physiological aids. In such cases and in certain emergency cases, the judicious use of the enema is not only helpful, but sometimes necessary. For example, in cases of senile constipation, where, as the result of long continued colitis, the muscular walls are thin and greatly stretched, while the colon itself has become abnormally redundant and folded upon itself, the daily or frequent use of the enema may be required.

The best means of administering the enema

is the fountain syringe. The tube should be long enough so that the reservoir, if necessary, may be raised to a height of five or six feet above the patient. When it is desired to stimulate the bowel to immediate contraction, the reservoir should be placed high, but when the purpose is to introduce as large a quantity of water as possible into the colon and to have it retained for a time, the reservoir should be placed at a height not exceeding two or three feet.

The position of the patient during the administration of an enema is not a matter of very great importance. In cases in which the pelvic colon is low down in the pelvis, as is shown by examination, it is well to put the patient in a knee-chest position. The water should be introduced very slowly. Ordinarily, however, the patient may lie upon the back or either side, or the enema may even be administered standing. The water quickly finds its way along the colon, no matter what the position of the patient may be.

The use of the colon tube is quite unnecessary. Indeed, as the writer learned long ago by experience, and as has been abundantly

proved by examination with the X-ray, the colon tube can rarely ever be introduced beyond the rectum. It is arrested at the pelvi-rectal fold, and simply returns and coils itself up in the rectum. A tube long enough to pass the water through the anus is as useful as the longest colon tube, unless the long tube is passed into the pelvic colon past the ileo-splenic flexure, a procedure which is rarely required, and, of course, should only be undertaken by a physician.

The enema may be employed in a variety of ways adapted to different occasions and purposes, and it may be repeated as many times as may be necessary. Warm water dissolves hardened fecal matters much more readily than cold water, yet in some cases it may be necessary to repeat the enema, at intervals of fifteen to twenty minutes, five or six times before the effect desired is obtained. When used for the purpose of softening hardened fecal matters, the water should be introduced slowly, and the patient should be instructed to retain as much as possible. The enema should be repeated as long as the water contains fecal matters when returned.

The Hot Water Enema

The temperature of the water should be 105° to 115° F. The quantity may be from one to three pints. This is preferable in cases of colitis and when abdominal pain or tenderness is present.

The Hot Soap Enema

The addition of soap to the water somewhat increases its power to dissolve hardened feces, although the advantage of its use is not so great as might be supposed. The amount of soap should be sufficient only to make very weak suds, as otherwise it may be irritating, especially if the soap contains a considerable amount of free alkali. Ordinary soap is best for the purpose.

The Hot Saline Enema

Half an ounce of salt is added to two quarts of water at a temperature of 105° to 115° F.

The purpose of the addition of salt is to lessen the irritation of the mucous membrane. It is of special use in cases of colitis, in which

the enema is administered for the purpose of removing mucus and relieving spasms of the intestine. The application should be repeated until no mucus returns with the water. Care must be taken to secure evacuation of the water so as to avoid retention of a large amount of salt, which may do serious injury.

The Cold Water Enema

A cold application to the interior of the bowel is one of the most powerful means of stimulation which can be safely employed. Half a pint of water at a temperature of 50° F. will usually set up a very strong and painful contraction of the lower bowel. It is on this account necessary to begin with a moderate temperature. The first enema should have a temperature of 80° to 85° F. The temperature may be lowered on each application five to ten degrees, or until sufficiently powerful contractions are produced to expel quickly the water introduced. By gradually reducing the temperature in this way, one as low as 40° F. may finally be used without causing excessive pain. Such low temperatures are very

seldom required except in dysentery, in which they often render great service.

The cold enema is of special use in cases in which the colon has become gradually dilated and has become atonic, and contracts with insufficient force to expel its contents. In such cases a warm or hot enema is usually retained. By following the warm enema with half a pint or a pint of water at 60° to 70°F., prompt contraction of the bowel almost invariably follows, with expulsion of the bowel contents. This is a very important practical use of the cold enema, as the retention of the water in cases in which the bowel is filled with putrefying fecal matters is very often followed by very unpleasant and even serious effects, through the absorption of enormous quantities of toxic substances, which are dissolved by the water and brought into contact with the absorbing surface of the bowel. In such cases the hot enema should be immediately followed by a small cold enema, and the cold enema should be repeated several times, if necessary.

The Oil Enema

The amount of oil required is four to six ounces. Either pure olive oil or any sweet oil may be employed. The latter is just as good as the former, and is less likely to produce nausea and vomiting, which sometimes follows the use of olive oil of an inferior grade. The temperature of the oil should be 104° F. As a means of softening hardened feces, oil is no better than water; in fact, according to the writer's experience, it is less efficient. It is useful, however, as a means of lubricating the lower bowel, and when introduced at night prevents hardening and drying of the feces. For this purpose four to six ounces should be introduced at night. When used for the purpose of lubrication only, a good plan is to administer the oil before breakfast. This is an excellent means of securing a thorough evacuation of the colon.

Sugar and Water Enema

Sugar is a powerful stimulant of the colon. A very old-fashioned remedy is the introduction of molasses into the colon. To half a

pint or pint of molasses an equal quantity of hot water is added. A prompt action of the colon usually follows the introduction of this mixture. The writer has for years used malt sugar for this purpose, and with most satisfactory results. The malt sugar not only acts as a stimulant to the bowel, but at the same time furnishes valuable nourishment. Four ounces of malt sugar should be added to a pint of water.

The Acid Enema

The colon responds more naturally and vigorously to mild acid stimulation than to almost any other form of stimulation. It is due to the fact that under normal conditions the contents of the colon are acid. Putrefaction produces ammonia and other alkaline substances which paralyze the colon. For an acid enema, add to three or four pints of water the juice of one or two lemons, or in the absence of lemons a dram or more of lactic or citric acid may be added to the water. It is necessary to make sure that the acid is completely dissolved and thoroughly mixed.

Paraffin Oil Enema

Liquid paraffin, or paraffin oil, may be used as an enema in place of olive oil and other oils, and has the advantage that it does not produce nausea or other unpleasant symptoms. Paraffin oil is better than any animal or vegetable oil, for the reason that the oil enema often causes nausea, loss of appetite, and coating of the tongue.

The Glycerine Enema

One to four ounces of pure glycerine introduced into the rectum is a highly efficient laxative when the "call" is lost. If pure glycerine is found too irritating add an equal amount of water.

The Cold Rectal Douche

By introducing cold water into the rectum with considerable force, a most powerful stimulation may be produced. The temperature of the water should be 70° to 80° F. If the stream furnished by the ordinary fountain douche has not sufficient force for this, a bulb syringe is necessary.

In administering the rectal douche a return tube should always be used, so that the rectum will not be over-distended. A small tube should be connected with the syringe, and a large one should be introduced alongside it to counteract the over-distention of the rectum. When the powerful stimulation of the rectal douche is required, it is not desired to secure the stimulation which results from distention of the rectum, for in these cases the rectum is always relaxed, and has to a certain degree lost its contractile power. It is desired only to obtain the stimulating effects produced by a low temperature and the impact of a stream of water introduced with considerable force; the effect of such an application is to produce almost immediately a very strong defecating reflex, with contraction of the pelvic colon and forcible expulsive efforts.

It is well that the enema tube should be introduced its full length and should be directed somewhat backward, so that the stream of water may be received upon the upper part of the rectum and, if possible, reach the pelvi-rectal fold.

In cases in which the sensibility of the rectum is largely lost, this measure affords a very excellent means of restoring normal sensibility. In extreme cases the alternating rectal douche may be employed.

Injury from Drug Laxatives

While the temporary use of medicinal laxatives is sometimes necessary, and always justifiable when required as an emergency means, there can be no doubt that the continued use of drugs of any sort is highly injurious to the intestines, and in many cases to other organs with which the drug comes in contact, particularly the liver and kidneys, which are burdened with the elimination of a certain part of the drugs employed.

All laxative drugs are irritant poisons. They affect the stomach as well as the colon and small intestine. Their long continued use in time gives rise to gastric and intestinal catarrh, colitis and the varied evils which accompany these disorders.

All laxative drugs, excepting, of course, agar and paraffin, which should be regarded as accessory foods rather than as drugs, cause

a spastic contraction of the descending colon. It is for this reason that the use of drug laxatives is usually followed by increased inefficiency of the colon. In such cases the water given by enema is retained or returned slowly.

Most drugs which act upon the bowels produce their effect only after having been absorbed and circulated through the blood. This has been proved to be true even in the case of saline laxatives, which are absorbed in the upper part of the intestine, and acting through the nerve centers controlling the colon, produce a laxative effect long before the drug has reached the colon through the intestine.

The effects of any other laxative drugs may be produced by injection under the skin.

It is thus evident that the action of laxative drugs is not confined to the intestine, but through absorption into the blood stream these irritating substances are brought into contact with all the tissues.

Among the most largely used laxative drugs are aloes, senna, rhubarb and cascara. All of these drugs contain substances which are irritant poisons derived from anthracene.

According to Levin, when a preparation of aloes is "employed for a length of time, there occurs, in consequence of the persistent congestion of the descending colon and rectum, dilation of the hemorrhoidal veins." Fallopius said that "out of a hundred persons who make habitual use of aloes, ninety are attacked by hemorrhoids."

Sollman says that: "When injected hypodermically, aloin causes a tubular nephritis, acute Bright's disease." The extensive use of this irritating drug in various popular laxative drugs and much advertised nostrums may well be one of the active causes of the alarming increase in disease of the kidneys, which has occurred within the last thirty years.

Rhubarb, according to Sollman, contains a poison that produces a secondary constipation.

Saline laxatives throw an enormous burden upon the kidneys, and when often repeated give rise to a very obstinate colitis.

They also impair digestion, in time, setting up gastric and duodenal catarrh and producing achylia, a condition in which the stomach glands produce no hydrochloric acid, thus

leaving both the stomach and the intestine a prey to the various sorts of pernicious bacteria which are constantly finding their way into the stomach through the mouth, especially through the medium of flesh foods, milk, and cheese.

The effects of laxative mineral waters are essentially the same as those of saline laxatives, which they are.

Saline laxatives are particularly injurious to bedridden patients, because of the slow emptying of the stomach usual in such cases, in consequence of which the stomach is more than ordinarily damaged.

Calomel, a drug which since the time of Paracelsus has been extensively used as a laxative, and in conditions resulting from constipation, one of the most common of which is popularly known as "biliousness," is often a potent remedy, affording prompt relief; but when its use is often repeated, it becomes a highly dangerous and injurious agent. All metallic drugs are combated by the liver, which absorbs as much as possible of the poison into its own tissues as a means of protecting the rest of the body. Thus the liver is par-

ticularly subject to injury. Bennett, of Edinburgh, showed more than a hundred years ago that calomel does not increase the action of the liver, and his observations have been in recent years confirmed by Rutherford and others.

Every chronic sufferer from constipation should know that there is no laxative drug known, the constant use of which is harmless. All laxative drugs are irritants. The more certain their action as laxatives, the more certainly will their continuous use for any length of time be followed by serious injury. Said an eminent German physician, "Nothing is so bad as the chronic use of laxative drugs."

Mineral Oil

Petroleum oil, as found in its native state, has been long used by primitive people and pioneers as a remedy for constipation. Arbuthnot Lane informed the writer (1911) that he had learned from authentic sources that petroleum had been used for centuries by the Kaffirs, and it is well known that it was employed as a domestic remedy in America long before it was used for illuminating pur-

poses. The oil was found floating upon the waters of certain streams and was collected and sold by itinerant peddlers, and occasionally in drug stores.

Paraffin is not acted upon by any of the digestive juices, and is not absorbed. It prevents the drying of the feces, lubricates the colon and rectum, and also to some extent prevents the absorption of toxins from the intestine. It may possibly to some degree encourage fermentation by preventing the absorption of digesting food stuffs and in the same way may tend to encourage putrefaction. The writer, on this account, has found it of use to combine it with agar-agar, so as to facilitate intestinal action by increasing the bulk of the feces. By the addition of some syrup, carbohydrates and concentrated fruit juice, honey, or malt syrup, the tendency to putrefaction in the colon may be antagonized, and thereby any possible evil results avoided.

Paraffin oil will not remedy every defect in the defecating process and hence will not cure every case of constipation, but it comes nearer being a panacea than any remedy which has heretofore been found, and does

meet a surprisingly large number of indications. After a careful study of its effects in several thousand cases, the writer feels justified in saying with much confidence that paraffin oil may be relied upon to accomplish the following results in the treatment of chronic constipation:

1. It lubricates the alimentary canal throughout its whole length. In a large number of cases of constipation there is an excessive absorption of water from the colon, leaving the feces dry or pasty and adhesive. An examination of the rectum and pelvic colon in such cases shows the mucous membrane to be deficiently lubricated by mucus, and covered with flakes of adhering feces. The use of half an ounce or an ounce of paraffin oil at bedtime, and half as much an hour before each meal, will in two or three days change the condition completely, as shown by proctoscopic examination.

2. This mechanical lubricating action of paraffin is highly important in overcoming kinks due to redundance or to adhesions resulting from colitis or other causes. When the mucous surface is kept well lubricated, the

fecal matter slips along and easily overcomes mechanical obstacles, which otherwise become formidable sources of obstruction.

3. The human alimentary canal, like that of other primates, as illustrated in the diet of the higher apes, is adapted to a moderately coarse bill of fare. The concentrated diet of our modern civilized life contains so little indigestible material that the residue forms a pasty mass which tends to adhere to the intestinal wall, especially when any obstruction is presented by kinks, folds, adhesive bands, or a spastic state of the bowel due to colitis. When delay occurs, the further absorption of water converts these pasty residues into hard masses, scybala, which sometimes have almost the density of wood. Fats of all sorts are more or less laxative if taken in sufficient amount, through their effect in modifying the character of the food residues. They render the mass less adhesive and to some extent prevent dryness; but both animal and vegetable fats are digestible and absorbable, and hence are not to any considerable degree effective in changing the character of the stools unless eaten in amounts larger than can be used, so

that a considerable portion remains behind in the colon. Such large quantities of fat encourage putrefaction, lessen appetite, diminish the secretion of hydrochloric acid, interfere with the motility of the stomach and the small intestine, and may produce great disturbance of the body metabolism. Paraffin oil is free from these objections, since it is wholly non-absorbable, and a comparatively small amount serves the purpose required, because it all remains in the intestine.

4. Paraffin is useful in all forms of intestinal stasis or stagnation, no matter what the cause, by preventing the abnormal drying out of the food residue which is the necessary result of too long retention in contact with absorbing surfaces.

5. Another remarkably interesting and useful property of paraffin oil is found in the fact that it stimulates activity of the small intestine. Observations, in a large number of cases, made by Dr. J. T. Case, Roentgenologist at the Battle Creek Sanitarium, have shown that paraffin oil greatly accelerates the passage of material through the small as well as the large intestine. This action is exceed-

ingly important in those forms of intestinal toxemia which depend upon iliac stasis, by far the most serious of all forms of stasis. Stagnation in the small intestine is of far greater importance than stasis in the colon, for the reason that both putrefaction and absorption are much more active in this part of the digestive tube than in the large intestine. Even in cases in which iliac stasis is due to the so-called Lane's kink, as shown by X-ray examination, great relief may usually be obtained by the regular use of paraffin. This has been demonstrated in many cases. It is only in the most extreme cases, when adhesions are so extensive that the lumen of the intestine is very greatly reduced, that surgical measures become necessary.

6. One of the most interesting features of the many-sided useful activities of paraffin, is its behavior toward intestinal toxins. These toxins consist, not only of bile acids and alkaline wastes of various sorts excreted by the intestinal mucous membrane, but in addition, of a great variety of ptomaines and toxins produced through bacterial action, especially in the colon, and also in the small intestine in

cases of incompetency of the ileocecal valve. Paraffin is a highly active solvent, and readily dissolves these waste and poisonous substances, many of which are more soluble in paraffin oil than in water. The result is that the paraffin oil, itself not absorbable, takes up a very considerable portion of toxins found present in the intestinal tract, and thus prevents their absorption. When paraffin is used, it may always be seen in the stools, showing a brownish or blackish color, due to the substances which it holds in solution. In a laboratory test made by a competent chemist by request of the writer, it was found that when paraffin oil was shaken with a watery solution of indol, more than half the indol was quickly taken up by the paraffin. The use of paraffin thus affords an effective means of hindering the absorption of infective toxins, and conveying them out of the body.

7. Paraffin oil serves a useful purpose in protecting the mucous membrane when it is in an irritated state, as in cases of chronic colitis. The value of petrolatum and other neutral petroleum products as a dressing for wounds is well known. Paraffin acts in an

equally favorable way upon irritated mucous surfaces. It has long been used for this purpose in the treatment of diseases of the nose and throat.

8. Paraffin serves another useful protective purpose in hindering the absorption of poisons by mucous surfaces which have been deprived of their epithelium. The normal epithelial covering of the intestines has remarkable filtering powers, by which toxins, especially colloid poisons, are excluded.

This filtering power is lost when the surface is denuded. A protective layer of oil renders great service in such cases, by hindering the absorption of these poisonous matters, which occurs with great readiness through abraded surfaces.

9. In cases of colitis, paraffin oil protects the irritated surfaces, but also through its lubricating effect and through softening the intestinal contents, aids greatly in overcoming the spastic condition of the intestine, which in many cases of chronic constipation is so formidable an obstacle to recovery. Laxatives of all sorts increase the spasticity of the intestine, and so aggravate the constipation

which they are given to relieve. This is one reason why many are more constipated after taking a laxative than before. Temporary relief is obtained by the production of watery stools which are able to pass through the contracted bowel, but as soon as the first effects of the laxative pass off, constipation becomes worse than before, since the spasm is greater. Paraffin lubricates and protects the sensitive surface of the spastic bowel, and at the same time softens the intestinal contents so as to permit passage through the bowel without mechanical irritation. Cases of colitis are greatly benefited by the regular use of paraffin.

10. X-ray observations of Case, confirmed in many cases at the operating table by the writer, have shown that incompetency of the ileocecal valve is a most common and effective cause of iliac stasis. Experience in treating several hundreds of cases has shown that, aside from the regulation of diet, and the use of bran and agar-agar, the regular use of paraffin oil is the most effective means of combating this condition. Medicinal laxatives increase the antiperistalsis by which the re-

flux from the colon into the small intestine is increased. Case has shown by X-ray examination that paraffin increases the motility of the small intestine, *while it does not increase antiperistalsis*. It is thus a rational and efficient remedy of great value in dealing with this very large and important class of cases.

11. In all cases in which the stagnation of the small intestine is due to spasm of the ileocecal valve, induced by chronic appendicitis, ovarian irritation or inflammation, colitis, or possibly painful rectal disease through reflex irritation; paraffin proves itself to be an invaluable remedy, since it has the property of increasing the peristaltic activity of the small intestine to such a degree as to enable it to overcome the spasm of the ileocecal valve without producing irritation, which would inevitably increase the spasm of the sphincter, as do drug laxatives. The neutral character of paraffin, which enables it to stimulate and facilitate intestinal motility without producing irritation, is invaluable.

12. The regular use of paraffin oil very generally relieves hemorrhoids and fissure, even when of some years' standing. These

morbid conditions are usually the result of constipation, and are maintained and aggravated by straining at stool. By the habitual use of paraffin, the stools are made soft, straining is avoided, the intestinal contents are rendered less irritating and infectious, and thus the diseased tissues are readily healed.

Since adopting the use of paraffin, the author has found that the number of cases in which operation for hemorrhoids is needed is greatly reduced. Patients who have contemplated submitting to operation for removal of hemorrhoids of many years' standing, in a short time after beginning the use of paraffin, often find themselves so completely relieved that an operation is no longer necessary.

13. Paraffin is capable of rendering invaluable service in cases of intestinal intoxication, by increasing the number of daily stools. The length of time which foodstuffs remain in the intestine is reduced from several days to a few hours. This greatly lessens the opportunity for development of putrefactive processes and the absorption of putrefaction products. It may be justly said that no other remedy is

capable of rendering such important and efficient service in combating constipation as this simple and harmless agent; but it must be continuously, a proper dose (one or two tablespoonfuls) at each meal.

Objectionable Features of Paraffin

The few unpleasant effects attending the use of paraffin are really so slight in character that they are generally easily overcome. Sometimes, however, they constitute a real obstacle to the use of this most valuable remedy. The chief objections which are met are the following:

1. An unpleasant oily taste which to some people is so disagreeable as to produce nausea and loss of appetite.

2. A disposition to separate from the other intestinal contents. It usually appears as a brown oily liquid separated from the rest of the stool and sometimes the separation is so marked that the stools are very ragged and consist of hard lumps smeared with brown oil.

3. Paraffin oil is so limpid that it readily finds its way to the rectum ahead of the other bowel contents, and very easily escapes, either

with or without the expulsion of flatus. The patient is often unconscious of the escape until it is noted that the clothing is badly soiled.

The difficulty of taking paraffin the writer succeeded in overcoming in part by preparing a heavy emulsion by the use of gum acacia. The emulsion is easily taken in hot or cold water and is much better tolerated by invalids and children.

Paraffin Tablets

All objections are removed by the use of paraffin in solid form. Paraffin tablets which are solid at ordinary temperatures, but melt at the temperature of the inside of the body, are easily taken with the food. Paraffin in this form mixes with the feces thoroughly and does not separate. A single tablet (one-half ounce) is usually sufficient for a dose. One tablet is taken with each meal. Two or more tablets may be taken without injury. Paraffin taken in this form (Paramels) is much more efficient than in the ordinary form, requiring only about half the quantity. They have a special advantage in the fact that they may be

taken with the meals and thus, becoming thoroughly mixed with the meal, the paraffin adheres to the food residues and renders most efficient lubrication. Paraffin in this form is never discharged unconsciously and so does not soil the clothing. In use the tablets should be cut into half a dozen pieces, which should be taken at intervals during each meal, and always with food in the mouth with which it should be thoroughly mixed.

The Food Residues, Not the Intestine, Require Lubrication.

It is to be remembered that it is the food or food residues rather than the alimentary canal that requires lubrication. It is this fact which renders paraffin oil inefficient in many cases. It does not mix well with the food. When taken before the meal, it passes along the intestine ahead of the food. When taken after the meal, it follows after the food. Inspection of the stools always shows a quantity of oil floating upon the surface. This floating oil has rendered no service as it has not been mixed with the food. The solid form of paraffin, which melts at the temperature of

the body, has the advantage that when taken with the food and thoroughly intermingled with it, it remains with the food residues and does not separate, and thus becomes an efficient lubricant. Experience shows that Paramels often succeed in cases in which paraffin oil apparently has no effect.

Lubrication of the Rectum

In many cases of chronic constipation the lower colon and the rectum become dry, the result of atrophy of the lubricating mucous glands which have been destroyed by colitis or chronic proctitis. This condition may extend up into the pelvic colon. As a result, the feces adhere to the walls of the bowel and so accumulate, forming impactions and cumulative constipation. In many such cases only partial relief is obtained by a laxative diet. By the use of Paramels the lower intestine may be lubricated so as to prevent adhesion of residues. Ordinary paraffin oil does not serve the purpose satisfactorily for the reason that it will neither mix with the food nor adhere to the intestinal wall. The special paraffin used

in Paramels, having a melting point slightly above the body, at the body temperature acquires the consistency of a soft ointment which adheres to the surface of the bowel, and serves as a most efficient lubricant.

In specially obstinate cases this special paraffin (melting point 104° F.) may be injected into the rectum at night with great benefit. The temperature should be 104° F. and the quantity, two to eight ounces.

EXERCISES WHICH COMBAT CONSTIPATION

The exercises that are of the greatest value in cases of constipation are those which bring into strong action the muscles of the abdomen. The abdominal muscles are generally weak and relaxed, and the intra-abdominal pressure is consequently low.

By appropriate exercises the weak muscles may be strengthened; the intra-abdominal pressure may be raised and the colon may be thus enabled to contract with sufficient impetus to expel its contents.

Hill Climbing

Hill climbing is a more valuable exercise than walking on the level, because the abdominal muscles are brought into more active play. When mountain climbing is not an available form of exercise, nearly the same results may be obtained by climbing a ladder or by walking up and down stairs. The writer has also made use of the treadmill as

the means of securing muscular exercise similar to that required in hill climbing.

Horseback Riding

Horseback exercise is especially indicated as an exercise for constipation. Riding a considerable distance, however, is necessary to produce any decided effect, as, on the whole, horseback riding to a person accustomed to it, is not very active exercise, except when riding a hard-trotting horse.

Rowing

Rowing is one of the very best exercises to combat constipation, provided the chest is held high during the exercise, and especially if care is taken to give the trunk as strong a backward movement as possible; but care must be taken to avoid holding the trunk forward with the shoulders rounded and the chest depressed.

Tennis

Tennis may be highly commended for young persons and those who are sufficiently strong to engage in this form of exercise

without injury. This very popular game is, however, too vigorous for persons with weak hearts.

The Medicine Ball

This is a capital exercise for persons who are fairly strong. It brings the muscles of the trunk into vigorous action.

Work Exercises

The movements of chopping and digging, swinging the hammer and mowing are highly valuable exercises if taken with due care to maintain the body in an erect position. Many household occupations, such as scrubbing, washing, and general housework, are excellent forms of exercise when correct posture is maintained.

Posture Exercises

Of first importance to persons suffering from constipation is the maintenance of an erect position of the trunk. When the chest is lowered, as in sitting in a relaxed attitude, the distance between the breast bone and pelvis is diminished, so that the large muscles which form the front of the abdominal wall

are shortened and relaxed. In this attitude the muscles cannot be contracted sufficiently to produce the proper degree of intra-abdominal pressure. When the chest is held high, the rectus muscles are stretched and are thus able by contraction to produce the maximum effect in compressing the colon. Flat-chested persons are predisposed to constipation because of inefficient action of the abdominal muscles.

The ordinary chair must be regarded to a very considerable degree as responsible for the prevalence of flat chest and round shoulders, and the evils which result from this deformity. It is possible to sit in an erect attitude in a chair of any shape; but with a chair with a straight back, constant effort is required, by forcible contraction of the muscles, to maintain the body in an erect position. The moment the muscles are permitted to relax, the trunk falls into an abnormal and unhealthy attitude, the spinal column being curved backward instead of forward, as is natural and necessary for health.

As the result of an habitually wrong attitude in sitting, the same improper attitude is maintained when standing and walking, and the figure becomes deformed. A flat chest, round shoulders, and a forward carriage of the hips are characteristics to be found in the great majority of persons who lead sedentary lives, especially those who sit much at their work, such as accountants, writers, teachers, and professional people generally. One of the first things, then, for a constipated person to do is to correct his sitting and standing attitudes. This may be done by careful execution of the following exercises, which the writer has employed for more than 25 years with much satisfaction in the treatment of cases of this sort.

To Correct the Standing Posture

Stand against a straight wall. Place heels, hips, shoulders, head and hands firmly against the wall. Now bend the head backward as far as possible, or until the eyes look straight up to the ceiling, at the same time permitting the chest and shoulders to move forward. While holding the head in this

position, press the hands firmly against the wall; draw the chin down to position without allowing the shoulders to move backward, still holding the body rigid, allowing the arms to fall at the sides. In this position the chest will be held high and the abdominal muscles well drawn in. While holding this position execute movements with the arms; arm raising above the head, swimming movements, etc.

This is the correct standing position and should, as far as possible, be constantly maintained in standing and walking. It is impossible, of course, to hold the muscles constantly rigid. In relaxing, however, care should be taken to keep the chest forward, so that the body does not fall back into the former incorrect attitude.

Exercises to Correct the Sitting Posture

Sitting upon a chair or stool, preferably the latter, proceed as follows:

Place the hands on the hips, with the thumbs behind. Bend the head backward so as to look straight up to the ceiling; now bend forward as far as possible while still

keeping the eyes on the ceiling; now make firm pressure with the thumbs, and while pressing hard bring the body up to the erect position. Still keeping the eyes upon the ceiling, holding the elbows as far back as possible, and without for an instant lessening the pressure on the thumbs, bring the chin down to position.

If this movement is executed according to directions, it will bring the body into perfect position, with the chest raised high and the abdominal muscles well drawn in, as shown in the accompanying cut. To secure definite and beneficial results it is necessary to use a chair having a back of the right shape as shown in the accompanying illustration.

Breathing Exercise

Sit with the hands at the back of the neck, and the elbows in line with the shoulders, the chest held high, and the abdominal muscles well drawn in. Raise the heels and make rapid movements upon the floor with the toes for one minute. Then take ten deep breaths, still holding the arms in position.

Rocking Chair Exercise

Sitting upon the front edge of a chair, with the hands upon the hips, the thumbs behind, the elbows well drawn back, bend forward to an angle of 45° and then, holding the body rigid, throw the trunk backward, lifting the feet clear of the floor. Repeat. The effect will be a rocking movement. Breathe deeply. Repeat forty times. A rocking chair may be conveniently used in taking this exercise.

Exercise to Raise the Chest

Lie upon the back on a hard surface; place beneath the hollow of the back a roll of blankets or a folded pillow or cushion about six inches in diameter. The purpose of this is to give the spinal column the forward curve which is natural to it, and thus raise the chest. The roll should be placed at such a point as to raise the chest to the fullest extent, while the head and shoulders still rest upon the couch. In this position, deep breathing movements should be practiced at the rate of about ten a minute.

To Strengthen the Abdominal Muscles

With the back supported as in the previous paragraph, raise both legs to the perpendicular. Repeat ten to forty times. A deep breath should be taken just before the legs are raised, and after each movement there should be a pause during which a deep breath is taken.

Feeble and very fleshy persons are often at first not able to raise the legs. In such cases the exercise will begin with the legs drawn up to a fixed position. By extending the legs and allowing them at the same time to drop slowly to the starting position, the abdominal muscles may be brought into strong contraction, and as they gradually increase in strength, the legs may be flexed less until they can be raised to a vertical position without flexion.

Trunk Raising Exercise

Lying on the back and holding the legs firmly extended, raise the arms forward and raise the body to the perpendicular, then bend forward, and, if possible, touch the toes. Repeat ten to twenty times.

Rolling Exercise

Rolling over on the floor or on a wide bed is a capital exercise for strengthening the lateral muscles of the trunk. Practice for five minutes.

Rocking Exercise, Lying

Flex the left leg upon the abdomen; clasp the hands beneath the knee and pull as hard as possible, so as to force the thigh down upon the abdomen; then, with the other leg fully extended, cause the body to execute rocking movements by quickly moving the leg up and down, assisting by forward and backward movements of the head. Repeat same with the right leg. This is a very effective exercise if taken vigorously and repeated three times a day for five or ten minutes.

Arm and Trunk Exercise with Deep Breathing

Standing with the chest held high, place left hand upon the left hip. With a swinging movement sidewise bring the right arm to

the perpendicular, and then, holding the arm in position, bend the body to the left side as far as possible, breathing in. Rise to position, breathing out. Repeat four times and then execute the same movement with the right hand upon the hip, breathing in.

Squatting Exercise

Standing, with the heels separated ten or twelve inches, the hands upon the hips, execute squatting movements, bringing the trunk as near to the floor as possible, and bending slightly forward. An excellent exercise to stimulate bowel movement.

Running on All Fours

With arms and legs extended run about the room for five or ten minutes—running on all fours. This movement was prescribed by a Berlin physician for an eminent German statesman, with excellent results.

Knee-Chest Breathing

Placing the body in the knee-chest position, execute deep breathing movements, filling the chest as completely as possible, then, holding

the chest in position, draw in the abdomen as much as possible while breathing out.

Colon Compressing Exercise

Sitting on a low seat with the feet raised upon a stool, place the closed fists in the left groin and bend the trunk strongly forward so as to compress the hands between the thighs and the abdomen. Take several deep breaths while holding the body in position.

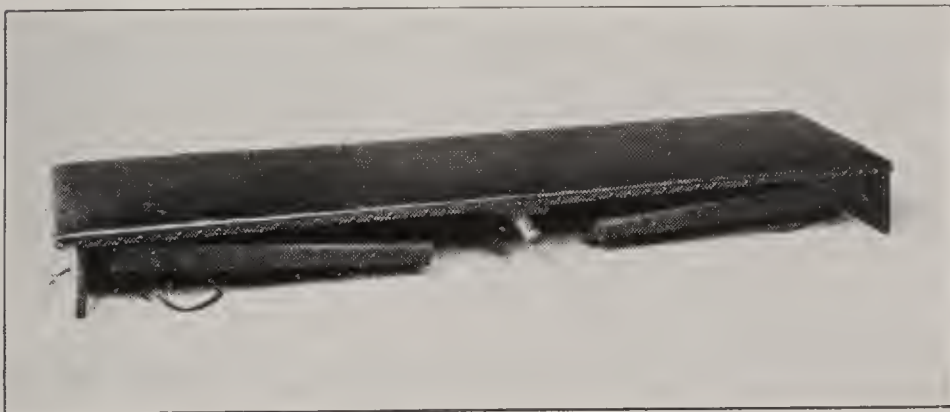
Inclined Plane Exercises

Among the most important of all forms of exercises for combating constipation, a series of certain simple exercises are taken upon an inclined plane, with the head low. The special advantages of the inclined plane are:

1. The head-low, hips-high position greatly aids in the replacement of the prolapsed stomach and colon, conditions almost universally present in chronic constipation.

2. The head-low position drains the abdomen of blood, thus relieving congestion of the viscera.

3. Exercises of the trunk muscles should always be taken after the prolapsed viscera



A Folding Exercise Table

have been restored to position. When this is not done, the effect may be to increase the displacement whenever the abdominal muscles are strongly contracted.

There are three classes of exercises to be taken with the inclined plane, viz: (1) Stretching exercises, (2) Colon replacing exercises, and (3) Trunk exercises.

The folding exercise table is a convenient appliance for use in these exercises. It may be in part replaced by an ordinary ironing board placed with one end resting upon the side of a bed, couch or window sill, the other on the floor. The exercise table is provided with a strap at one end to hold the feet and prevent slipping down and a rope with a handle attached for pulling the body up. At the sides are placed handles to be grasped by the patient.

Getting in Position

The following is a convenient method of placing one's self in position upon the table; Standing upon the left side of the table grasp the strap with the right hand. Sit down upon the table and swing up one foot

and place it under the strap, and then bring up the other foot in the same way, and then grasp the sides of the table or the handles and let the trunk fall down into position. While an ordinary ironing board may be used, the strap for the feet and the handles for the hands are really essential for convenient use.

After getting into position upon the table, the patient takes a few very deep breaths, holding the chest high while breathing out.

Exercises

Grasping the handles, bend the head backward as far as possible, at the same time widely opening the mouth as in yawning.

Position

Patient lies upon an inclined table grasping the handles. (a) Right arm, left leg stretch. (b) Grasping handle with left hand raise the right arm above the head and at the same time point the toe of the left foot and reach as far as possible in opposite directions. (c) Do the same with the left arm and right leg.

Colon Replacing Exercises

Lying on the inclined table with feet under the strap, place the hands upon the lower abdomen and breathe deeply; with each expiration press hard upon the little-finger side of the hands and draw the hand upward so as to push the contents of the abdomen toward the diaphragm. Hold the hands firmly in position during the inspiration. Repeat ten or twelve times.

Abdominal Compression-Breathing

Compress the abdomen firmly with the hands and take a slow deep breath. Repeat fifteen or twenty times.

Diaphragm Exercise

Lie upon the face over a folded pillow or cushion with the feet under the strap and the head resting upon the folded arms. Take deep breaths. This is an exercise for relieving congestion of the abdominal viscera, strengthening the breathing muscles. At each breath the diaphragm is compelled to lift the weight of the trunk.

Exaggerated Knee-Chest Breathing

Grasping the handles, rise from the position of the preceding exercise to a kneeling position, pushing the pillow forward a little and then take the knee-chest position; take ten to fifty deep breaths. This is a most effective means of draining the overfilled blood vessels of the abdomen and pelvis, and sets gravitation to work pulling the prolapsed organs into position. The exercise is still more effective if taken after filling the colon with water, as the added weight of the prolapsed organ assists in restoring it to position.

Leg Raising

Lying on the back, hands grasping the handles, while holding both legs straight and toes pointed, raise them to vertical position while counting four. Lower at the same rate. Repeat eight to twelve times, taking one or two deep breaths after each movement.

Trunk Twisting

Back lying, feet under strap, throw the extended right arm over to the left, at the same time turning the face and shoulders in

the same direction. Return to position, and repeat eight or ten times. Do the same with the left arm.

Hips Rolling

Back lying, draw the knees up as far as possible, then extend the limbs vigorously as far as possible toward the left, rolling the body in the same direction. When the legs are completely extended, carry them straight across to the opposite side, rolling back toward the right side. Complete the movement by drawing the legs back to the flexed position and returning to the starting position. Repeat ten or twelve times, pausing long enough after each movement to take one or two deep breaths. This is a most excellent exercise for all the muscles of the trunk.

Static Exercises

These are exercises which may be taken while one is engaged in study, writing, book-keeping, or some sedentary occupation, without interfering with the work in hand, the purpose being to combat the pernicious effects of any form of confining work.

With the chest held high, the abdominal muscles well drawn in, and the body supported in a correct posture, deep breathing may be practiced with most excellent results. The breathing may often be made rhythmical with the work, especially in typewriting, adding and similar work which is more or less mechanical in character. In this way exercise may become a means of increasing efficiency directly, as well as through better aeration of the blood and the resulting improvement in mental and physical activity.

This deep breathing may be practiced under almost any conditions without interfering with the work in hand. When riding on the street cars or in an automobile, even when sitting in church or at a lecture, deep breathing may be practiced almost continually. The practice will be found to promote bowel activity, and to enormously increase efficiency and endurance. When the habit is once formed the deep breathing becomes automatic. Typists, printers, and persons engaged in similarly unhealthful occupations may, by this means, so strengthen their resistance, and maintain such a high state of vital

efficiency, that they may possibly escape the dreaded pulmonary tuberculosis, the malady above all others that is the most fatal to this class of workers.

Tension Exercises

During life the muscles are always in a state of tension; that is, every muscle is more or less active even when it seems to be at rest. This tension is increased by cold to the point of producing visible movements of shivering. It is also increased by pain or inflammation, as is seen in the rigid contraction of the abdominal muscles in appendicitis. Tension may also be increased by a simple effort of the will. The mere thinking of a bodily movement, in fact, increases the tension of the muscles which are concerned in the movement, and to such a degree that long-continued fatigue may result, showing that work has been done, as when one watches the performance of acrobats, or a closely contested athletic game. This fact may be made of practical value. Thus if one's feet are cold, they may be quickly warmed by alternately tensing and relaxing the muscles of the legs,

or by making slow, tense, flexion and extension movements of the feet.

In like manner all the muscles of the legs may be brought into active play by simply setting or tensing the muscles of the legs, that is, holding the limbs rigid with as much force as possible. The muscles of the trunk and arms may be tensed in like manner. All the muscles may be tensed at once, or different parts, as the arm muscles, trunk muscles, or the muscles of a single limb may be exercised in succession. Tension exercises may be taken in many cases without the slightest interference with one's work; and when the work is very sedentary one may by this means, without loss of time, secure a large part of the benefit of such active exercises as walking, tennis, golf, etc. Such exercises should not be considered as a substitute, however, for out-of-door exercise, but rather as a supplement to such exercise.

One very excellent form of exercise which may be taken while sitting at desk at work or when reading or studying, is rapid raising or lowering of heels either together or in alternation. The heels are raised so that the weight

of the limbs rests on the toes, and the limbs are then set in rapid motion. Bracing the feet together, a similar movement may be executed with the knees rapidly separating and closing. The movement is so rapid that the exercise closely resembles shivering.

One excellent use for movements of this kind is to prevent taking cold when one is exposed to a draft. If, for example, one feels a draft of cold air on the back of the neck, he may prevent ill effects by simply tensing the muscles of the neck, or indeed, by holding the muscles rigid while making slow movements of the head, either forward and backward or side-wise. In out of door sleeping, exercises of this sort may be resorted to as a means of warming the feet and limbs. These warming exercises are important for persons suffering from constipation, because of the tendency that such persons have to coldness of the extremities, the result of spasm of the blood vessels, due to the influence of intestinal poisons upon the vasomotor centers.

An Exercise Program

When possible exercise should always be taken in a rhythmical way. This effect may be secured by means of counting, or better still by the aid of music, for which a phonograph, victrola or a graphophone serves an excellent purpose.

The following is an excellent program of exercises for a person of average strength:

1. On rising, take an exercise bath (see page 242), beginning with the water at a temperature of 90 degrees and ending at 70 degrees to 60 degrees or pipe temperature. Row 100 to 200 strokes counting.

2. Inclined plane breathing and replacement exercises.

3. Inclined plane exercise to strengthen abdominal muscles.

4. Special exercise to aid defecation.

After exercise make an attempt to move the bowels.

The author has arranged a series of 20 graduated exercises* which when used systematically, will secure good, all-round muscu-

* For description address The Health Extension Bureau, Battle Creek, Michigan.

lar development and are especially designed to aid bowel action.

A description of these exercises with appropriate music has been placed upon "records" by the Columbia Graphophone Company and may be reproduced on any of the various phonographic machines used for this purpose.

Special Means to Aid Defecation

The general aim of all the exercises given in this book is to aid defecation by strengthening the muscles of the trunk and abdomen, and forming the breathing movements. There are special exercises which may be employed during defecation which render effective aid in evacuation of the bowels.

The natives of India, as mentioned elsewhere, aid evacuation when the bowels are constipated by pressing a ball formed by a folded cloth upon the lower left side of the abdomen. Many constipated persons have found by experience the advantage of pressing upon this part of the abdomen with one or both closed fists during defecation.

Persons who have very relaxed abdominal

walls often find it very advantageous to compress and knead the abdomen during defecation, especially upon the left side. A medicine ball may be used for the purpose. The ball is held firmly against the abdomen, the under side resting on the separated thighs. By bringing the thighs together, at the same time pressing with the hands, the ball is forced against the abdomen. The abdomen may in this way be compressed with considerable force. The closed fist may be used in place of the ball.

Abdominal Massage

A radiogram of the colon or a tracing made by the aid of the X-ray, showing the position, size and form of the different portions of the colon is of greatest service. With the radiogram and such a sketch of the colon at hand, the masseur can make his applications with such a degree of accuracy as to effect a maximum amount of good with a minimum degree of effort, and without wearying his patient needlessly. The following methods of colon massage are described

at greater length in the author's work on massage.*

Massage of the Cecum

In cases in which there is stagnation of the fecal matters in the cecum and ascending colon, massage should be applied, with the patient's hips elevated to an angle of about 45°. Deep kneading movements should be made from below upwards, working along the colon in the direction of the lower ribs of the right side. When the liver is reached, the kneading movements should be carried across the body in the direction of the transverse colon. The hips of the patient should then be lowered, and the kneading movement should be directed downward along the descending colon, starting from the lower rib of the left side. When the upper border of the hip bone is reached, the movement should follow the inner surface of the bone to the pelvis. Not infrequently the colon is found in a contracted or spastic state when it feels like a rubber tube and may be rolled under the fingers. It is usually sensitive to pressure.

*The "Art of Massage." Published by the Modern Medicine Publishing Company, Battle Creek, Michigan.

When the pelvic colon is enlarged, it may also sometimes be felt, though not infrequently when it is distended with feces it lies so low in the pelvis that it cannot be reached. By putting the patient in a knee-chest position, and executing deep-breathing movements while making deep pressure with one hand on each side just above the groins, the pelvic colon can sometimes be lifted out of the pelvis, so that it can be brought within reach, and the hard masses with which it is filled may be broken up. In this region the colon will often be found filled with masses of hardened feces.

After careful manipulation of the contracted colon for a few minutes it will dilate, the spastic condition disappearing for the time being. The writer has often noticed this in making examinations of the colon. Harsh manipulations are likely to produce the opposite effect, increasing the spasm. This fact has led some authors to forbid massage altogether in cases of colitis, but this is quite wrong. Massage is highly beneficial in these cases but the manipulations must not be too severe.

Mechanical Kneading and Vibration

Mechanotherapy is capable of rendering more service in constipation than in any other single condition.

The mechanical applications which are of greatest service are kneading and vibration. Several mechanical kneaders have been devised. The one illustrated in this book, the writer has had in use for more than twenty years, and with satisfactory results. Patients generally realize immediate benefit from the use of the kneader, which may be employed for fifteen or twenty minutes twice a day, an hour after breakfast, and an hour or two after dinner.

The apparatus consists of six kneading arms attached to eccentrics, arranged in such a way as to be brought to bear upon the abdomen in consecutive order. The surface upon which the patient rests is at the same time moved to and fro in such a way that the kneading movement travels in a series of circles round the abdomen. The vigor of the application can be regulated at will.

There are vibrators of various kinds in

use. The majority, however, are possessed of too little power to be of service in the treatment of the abdomen. The best for this purpose are the dumb-bell vibrator and the vibrating chair. Hill's dumb-bell vibrator has the advantage that it is heavy enough to compress the abdomen to a sufficient degree; and the power of the apparatus is sufficient to give the whole abdomen an active vibratory movement. It has been proved that these vibratory movements induce peristaltic action, while at the same time the weight of the instrument increases the abdominal pressure, and tends to fix the parts to which the application is made, so as to secure a maximum degree of effect.

The vibrating chair aids bowel action both by directly exciting the centers of the spinal cord and by stimulating the lower bowel.

The oscillo-manipulator is the latest and perhaps the best means yet devised for mechanical manipulation of the abdomen as well as of other parts of the body. It is surprisingly efficient.

Self-Kneading of the Bowels at Stool

In many cases of cumulative constipation the chief trouble is in the pelvic colon. This loop of the intestine, usually about a foot in length, and possessing thick muscular walls, becomes sometimes so enormously stretched and attenuated by accumulations of fecal matters and gas that its walls are weak and contract very feebly, and it is no longer an efficient instrument for forcing the feces into the rectum, and thus inducing the defecating reflex by which the bowel is normally emptied. In such a case the patient may sometimes assist himself by placing the hand at the lower part of the abdomen on the left side and making deep pressure with the tips of the fingers, or placing the fist between the thigh and the abdomen so as to compress the pelvic colon. Kneading of the iliac colon, which lies in the hollow of the left iliac bone, is also useful.

The Cannon Ball

The cannon ball is a rather old-fashioned but useful means of self treatment, by which the patient may apply massage to the colon

in a very efficient way. A small cannon ball weighing about twenty or twenty-five pounds is rolled along the course of the colon from the cecum toward the rectum. The patient should lie with the shoulders slightly elevated so as to relax the abdominal muscles as much as possible.

The cannon ball should be applied daily soon after breakfast, or a little before the time at which the bowels are most likely to move. The chief benefit to be derived from the cannon ball is to aid in propelling into the rectum from the pelvic colon a sufficient amount of fecal matter to awaken a lively stimulation of the defecating center, and so to secure a strong impulse and a full evacuation of the colon below the splenic flexure.

The Weighted Compress

This consists of a thick flannel compress between the folds of which is quilted in a considerable quantity, say fifteen to twenty-five pounds of lead shot. The compress should be large enough to cover the entire abdomen. It should be applied for an hour before time for evacuation of the bowels, deep breathing

movements being executed in the meantime at the rate of twelve to sixteen per minute.

The Shot Bag

This device has essentially the same purpose as the preceding, but may be applied in such a way as to secure a more pronounced local effect, as, for example, to force stagnating material out of the cecum or the iliac colon. It may, in some cases, also be of service in forcing feces from the pelvic colon into the rectum, when the pelvic loop has been weakened by excessive overloading and distention with gas. The usual weight of the shot bag is twenty to twenty-five pounds. It should be placed over the spot where the accumulation can be felt with the fingers or seen with the X-ray and should be left in place for an hour, while deep breathing movements are practiced at the rate of twelve to sixteen per minute.

This simple measure has the advantage that it may be used by the intelligent patient at his home, and its use may be continued for an indefinite time without injury, which cannot be said of any drug remedy. All drugs

which act by irritating the intestine, sooner or later, usually sooner, produce colitis and other disorders. There are no harmless drugs. Of course this does not apply to such purely mechanical and harmless means as bran and paraffin.

Pneumatic Compression of the Abdomen

Compression of the abdomen by an inflated rubber bag is a measure of value, of which the writer has made use for some years. On one occasion, a patient who seemed dead from surgical shock was restored almost instantly by placing a rubber bag under an abdominal bandage and inflating it as fully as possible. The face, which had become ashen gray, while the heart had ceased to beat, at once became flushed with the color of health, the heart began to beat, the patient began breathing and death was averted. This observation showed the effect of abdominal compression applied in this way, and suggested the use of the same means to increase the intra-abdominal tension as an aid to bowel movement. In using the bag for this purpose, it must be tightly compressed by

means of a stout bandage, and must be large enough to cover the whole abdomen, so that when inflated it will well fill the abdominal cavity, pressing before it the relaxed abdominal wall.

The compression bag is of special service in cases in which the abdominal muscles are very greatly relaxed, as in women who have borne a number of children, and whose muscles have not been well developed. It is most applicable to those who have not a superabundance of fat, especially those who have lost much in weight after having been overfat.

The Abdominal Supporter

While compression of the trunk at the waist is always harmful, compression and support of the lower abdomen is of great service in many cases, because of the unnatural feebleness of the abdominal muscles. In fleshy patients almost any sort of bandage will accomplish good, but in thin patients an ordinary bandage is of little use, for the reason that it is held out in front by edges of the iliac bones, and so does not press with suffi-

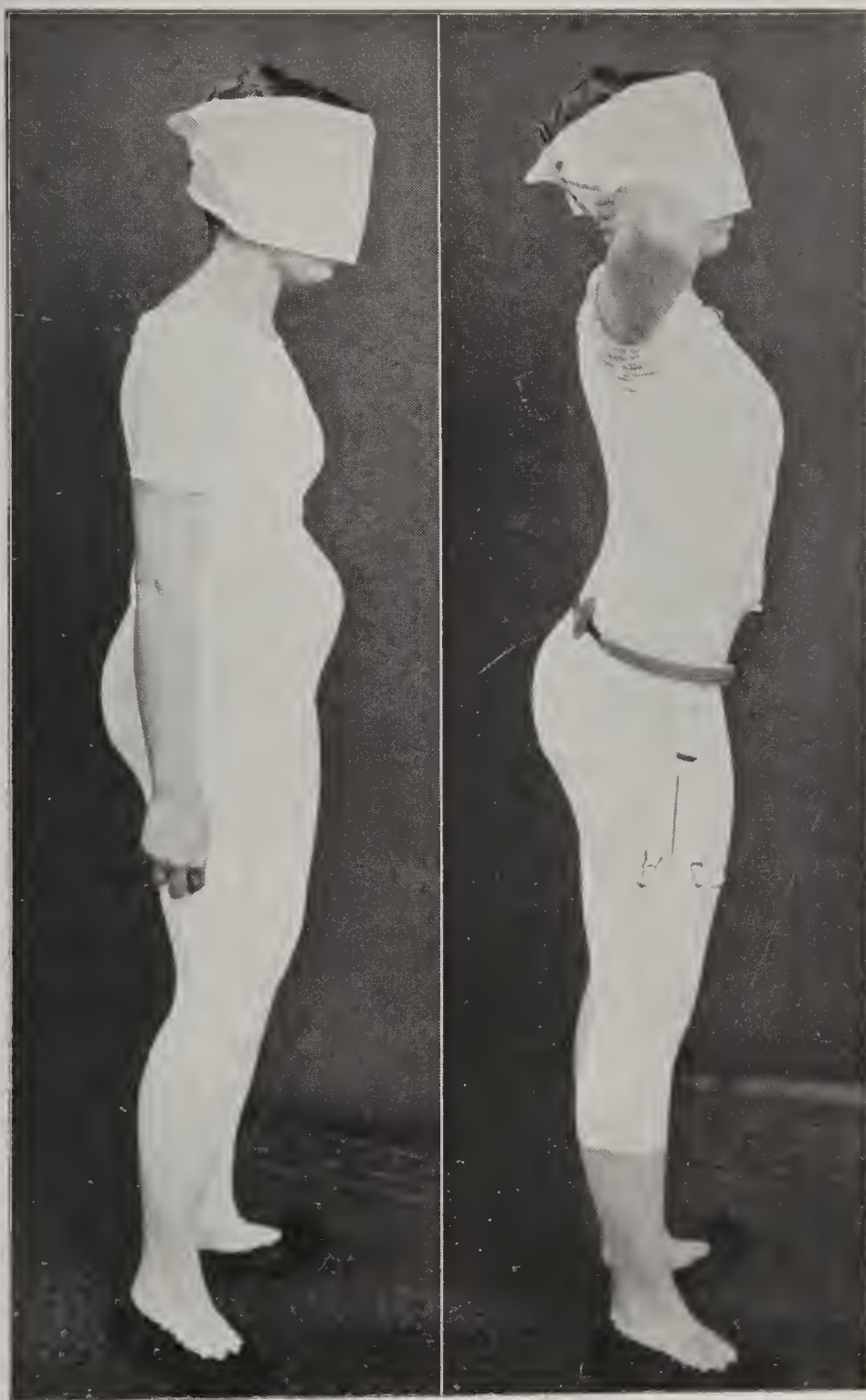
cient firmness upon the lower abdomen where support is needed.

The most effective support in such cases can be secured only by a bandage which is compressed by springs. Such a bandage, which the writer has had in use for more than a dozen years, is shown in the accompanying cut. In fleshy patients a stout bandage made of ducking and cut to fit snugly is of greatest service.

The bandage must be worn constantly when the patient is on his feet. Its purpose is not simply to support the viscera, which the best of bandages can do only in a very small degree, but to increase the intra-abdominal pressure to such a degree as to assist the colon in disposing of its contents. Some patients are completely relieved of constipation by the use of a proper bandage.

In most cases it is necessary to employ perineal bands to keep the bandage in position at the lower abdomen, where alone it can be of service.

Pain in the back is one of the disagreeable symptoms which an efficient bandage often relieves, especially when the pain is due to



THE ABDOMINAL SUPPORTER

Relaxed protuberant abdomen, a result of bad sitting position.

The same person standing, poise corrected and abdomen held up by a spring supporter.



Kneading the Colon

enteroptosis, or prolapse of the intestines, rather than colitis.

A sense of exhaustion, often resulting from low intra-abdominal tension, which permits an undue amount of blood to accumulate in the abdominal vessels, robbing the brain and spinal cord, is almost immediately relieved by a proper bandage.

The bandage is only a palliative, however, and its use must be accompanied by the development of the abdominal muscles by means of massage, electricity, and suitable exercises.

In cases requiring the use of the abdominal supporter during the day, the moist abdominal girdle should be worn at night to aid in relieving congestion. The bandage should be used with the mackintosh protection, and the bandage should be removed or renewed before it becomes dry.

EFFICIENT ELECTRICAL METHODS

While electricity is certainly not a panacea for constipation, nor for any other disease, and is certainly not able to accomplish a tithe of the miracles which have been attributed to it, it is nevertheless, when skillfully applied, a most valuable remedy in constipation. As ordinarily used by means of sponges held in the hands, and employing a current from a small buzzing faradic machine, nothing more is accomplished than a slight titillation of the skin and giving the patient a slight amount of pain, which may, however, in some cases, exercise a beneficial psychological effect.

Electricity may render valuable service in constipation in two ways: (1) By inducing automatic exercise of the abdominal muscles and so restoring their tone and strength; and (2) by stimulating the colon itself and thus inciting bowel action; and (3) by restoring lost nerve sensibility to the rectum. This it does both by directly exciting bowel action

and by raising to activity sensibility of the rectum when lost by neglect.

Automatic Exercise

Automatic exercise of the abdominal muscles may best be administered by the aid of the sinusoidal electrical current. The static or faradic current may be used, but they are more or less painful and less easily controlled. The sinusoidal current is practically painless. The most convenient method of using the current is by means of the automatic exercise apparatus which may be adjusted so as to cause any desired number of vigorous contractions of the abdominal muscles per minute.

By this means the abdominal muscles and the nerves and nerve centers which control them may be powerfully stimulated and their functions gradually restored.

Electrical Stimulation of the Colon

Applications of electricity to the surface of the body do not excite action in the colon; but the colon may be excited by the application of the current directly to the interior of

the colon. This cannot be done by the patient himself, as the services of an expert proctologist are needed for the proper placing of the electrode.

Electrical Stimulation of the Rectum

The application of the sinusoidal current to the rectum by means of a proper electrode is a most effective means of stimulation of the rectum when its normal sensibility has been greatly diminished or lost by neglecting to attend properly to Nature's "call" for evacuation of the bowels. For this purpose the very rapidly alternated current is best. The applications should be made daily. The duration of the application should be about ten or fifteen minutes, and the strength of the current as much as the patient can bear without discomfort. Not infrequently the effect of the application is to provoke an immediate evacuation of the bowels.

Diathermy or Thermo-penetration

This new application of electricity which we owe to Dr. Nagelschmidt, of Berlin, is a most interesting medical use of the so-called

wireless electrical current. In the body the high frequency waves of electrical energy are wholly converted into heat so that no electrical sensation or other sensation except heat is felt. The special advantage of diathermy over other forms of heat applications is that the heat may be applied to the deepest parts as easily as to superficial parts. This is due to the wonderfully penetrating power of this current.

Diathermy is a valuable means for employment in the treatment of colitis. The application of the current to the spastic colon causes it to relax, and likewise relieves the pain in the colon as well as the back and other reflexly related parts.

SPECIAL TREATMENT OF DIFFERENT TYPES OF CONSTIPATION

The practical management of cases of constipation is in its main features the same, irrespective of the type or form which the disease may assume. However, there are certain special features of each of the several characteristic phases of this diseased condition which require special consideration.

Without recapitulating the details of what has been said in the preceding chapters respecting the hygiene and preventive methods, the next few pages will be devoted to a summary of the methods which have proved most effective in dealing with several forms of constipation.

Treatment of Simple Constipation

The patient must set himself resolutely to improve his general health in every possible way. He must avoid all habits known to be injurious, such as the use of tobacco, alcohol,

tea or coffee. Indulging in late hours, irregular meals, use of rich and highly seasoned foods, unwholesome dress, worry and every unnecessary expenditure of vital energy which does not bring with it a compensating addition to vital resources, must be resolutely abandoned. The general rules and principles which have been set forth in the preceding chapters respecting the regularity of bowel movement and the use of laxative foods in sufficient quantity must be scrupulously followed.

The special exercises recommended for strengthening the abdominal muscles, correcting wrong attitudes in sitting and standing, must be taken systematically twice a day. Feeble persons will, of course, begin with lighter exercises, increasing their vigor as they improve. No less than thirty minutes should be devoted to exercise daily.

The exercise bath is especially recommended because it economizes time by combining the tonic cold bath with vigorous exercise of the most helpful sort.

In all cases in which the colon is prolapsed, and when there is a flabby state of the abdom-

inal muscles, a carefully fitted abdominal supporter must be worn.

Diet

The most important of all measures is the careful regulation of the diet, not only with a general view to a laxative effect, but to suit the needs of the individual patient. It must be remembered that, above all things, the food must be attractive and it should be eaten at such times and in such quantity that it will always be taken with keen relish. When the mouth waters at the sight and smell of food, it is a good sign that the whole digestive apparatus is ready to undertake the work of digestion with promptness and vigor.

The bill of fare must as far as possible be made up of foodstuffs which leave a residue of cellulose. Fine flour bread should be wholly discarded from the dietary. Bread or biscuit made from coarse graham meal or rye meal should replace other breadstuffs. It is in many cases advantageous to increase the amount of cellulose in the bread by mixing with the flour one-tenth its weight of bran.

All green vegetables should be freely used at the principal meals. Potatoes may be eaten in moderation, but should not constitute the chief vegetable food, for the reason that they are almost completely digested, containing a minimum amount of cellulose, as will be seen by reference to the table of vegetable foods. It is well to select those vegetables which are richest in cellulose. When the digestion is fairly good, such vegetables as beetroot, spinach, squash, asparagus, cabbage, carrots, turnips, and cauliflower should be very freely used. Two or three of these vegetables may be taken at each meal. Uncooked vegetables of some sort should be taken at least twice a day at the principal meals. Lettuce, celery, cucumber and cabbage may always be taken with very great advantage if the gastric digestion is fairly good. There are very few who cannot take one or more of these green vegetables if care is taken to observe that they are fresh and crisp, and pains are taken to masticate thoroughly. Even radishes may be eaten in moderation, if the irritating skin is removed.

Fruit, both stewed and fresh, should con-

stitute a part of each meal. Fruit is especially valuable for the last meal of the day, and fresh fruit may be taken with advantage just before retiring at night, and as an early meal by those who rise early and breakfast late. The acids and sugars in fruits stimulate bowel action, but to secure this effect they must be taken in considerable quantity. Those who take two meals a day may often take with advantage two or three oranges or as many apples just before going to bed at night. Juicy fruit requires no work of the digestive organs, except to move it along and absorb the predigested nutrient which it contains. This remark, of course, does not apply to such fruits as dates, which contain a considerable amount of cane sugar, nor to the banana, which is really quite a hearty food, but relates only to such juicy fruits as oranges, apples, peaches, apricots, berries, pears and grapes.

When the bill of fare consists largely of such foodstuffs as fruits and vegetables, it is necessary to give careful attention to the actual food content of the meal. There is a wide variation in the amount of nutriment

contained in different fruits and vegetables. For example, an ordinary serving of potatoes represents 100 calories of food, while a serving of cauliflower represents 25, and is mostly wood and water. A serving of beetroot represents 25 calories, while a serving of cabbage or lettuce contains only 7 calories.

It is important to remember that every meal must include a due proportion of ballast or roughage and there is very little danger that the amount will be too large. The stomach can easily deal with a very considerable amount of indigestible material. Even persons suffering from colitis and other intestinal disorders may take large quantities of roughage not only without injury but with great benefit. It should be constantly remembered that bran is not irritating and the colitis is the result, not of mechanical irritation but of the chemical irritation of putrefaction products.

The question as to the number of meals is one that should receive careful consideration, and often requires the exercise of the best skill and judgment. Stomachs which empty slowly require more time between meals.

It is especially important that care should be taken to include in the bill of fare a sufficient amount of fat. Fat is not only a nutrient of the very highest value, but it is a laxative food element, partly because by its use the secretion of the bile and other intestinal juices is promoted, so that the intestine is benefited by their laxative influence, and also because a portion of the fat remains behind unabsorbed, acting as a lubricant and also as a stimulant to the colon.

Most cases of simple constipation are promptly relieved by the adoption of the measures above recommended. The amount of bran may be increased almost *ad libitum* when necessary. In addition to the bran taken in the food, one or even two heaping tablespoonfuls of cooked and sterilized bran may be taken at each meal. Palatable preparations of bran are now available which makes possible the free use of this most important aid to bowel action without inconvenience. If any further assistance is needed it is to be found in the use of mineral oil and changing the intestinal flora by the use of lacto-dextrin.

Treatment of Rectal Constipation

In the treatment of rectal constipation it is to be borne in mind that the principal obstacle to bowel movement is the undue accumulation of fecal matters either in the pelvic colon or the rectum, or as is most often the case, in both the pelvic colon and the rectum. In many cases the food is carried from the stomach to the colon with a proper degree of rapidity, and the feces move at the normal rate through the colon, until they have passed the splenic flexure. At this point the delay begins. In time, through extraordinary neglect, when the feces are allowed to accumulate for days and even weeks in succession, the colon and even the small intestine may become enlarged through the obstruction at the outlet.

The chief cause of rectal constipation, in ordinary cases, as has already been pointed out, is neglect to attend to the "call" of Nature for the evacuation of the bowels. When the "call" occurs, it is because the rectum is distended with feces.

If the defecating mechanism is interrupted

in its action, and its purpose thus thwarted, the "call" becomes less intense and the effort to defecate is so slight that it is easily suppressed. Later, in the worst cases, the desire to evacuate the bowels entirely disappears. In these cases the sensibility of the rectum has become blunted to such a degree that the normal reflex is lost. The rectum tolerates the presence of feces without protest and without giving any signal to the defecating center that bowel movement is required.

It is evident, then, that in the treatment of cases of rectal constipation the first and most essential thing is restoration of the normal sensibility of the rectum. It must be remembered, however, that in most cases of rectal constipation, as well as in other forms of constipation, the condition has existed for a long time. The disease has consequently extended to the entire colon, and perhaps to the entire intestine, and success will not be obtained by attention to the colon and rectum alone; consequently, the treatment of rectal constipation requires the use of all the measures which have been recommended for simple constipation.

The first thing to be done in beginning the treatment of rectal constipation is to thoroughly evacuate the lower bowel and rectum. This is best accomplished by the use of the enema. It is certainly irrational to administer a laxative or cathartic, which disturbs the alimentary canal through its whole length, for the purpose of removing an obstructive accumulation which perhaps lies within six inches of the lower outlet.

A simple water enema at a temperature of 104° to 110° F. should be given to soften the hardened feces, and should be repeated at intervals of half an hour, until the colon is completely emptied, as shown by the return of clear water. The addition of soap to the water sometimes hastens the softening of very hard fecal matter. Warm oil has been much recommended, but it dissolves hard feces less rapidly than water. At first it may be impossible to introduce more than a small quantity of water, on account of the extreme distention of the rectum and pelvic colon with feces. By persevering effort, however, success will be attained; as the hard feces are gradually softened and dissolved, larger

quantities of water may be introduced until the whole colon may be filled with water and emptied of its putrefying contents. In cases in which the fecal accumulation has been going on for several weeks, the patient must be put in charge of an experienced nurse, whose efforts, under careful instruction, must be unremitting until the task is completely accomplished. When the feces are very hard, and the masses of considerable size, oil should be used at intervals to lubricate the walls of the bowels, which, in such cases, are often dry and sometimes roughened.

After the bowels have been first thoroughly emptied, infinite care must be taken to see that another accumulation never occurs. Every time the bowel is distended by fecal accumulation, its muscles are weakened, the sensibility of its nerves diminished, and any improvement which may have been secured by previous treatment is lost. By the systematic use of the enema, the bowel, being kept empty, gradually contracts and returns to something like its normal proportions.

The cold enema should always be used for contracting the bowel after the fecal matters

have been removed by a warm enema. When once the bowel has been thoroughly emptied, warm water may no longer be required and it will not be necessary to resort to the use of the hot enema. The temperature of the water ordinarily used for the evacuation of the bowels may then be about 80°. After a little training, a lower temperature may readily be tolerated and is greatly preferable. When very cold water is used, the effect is sometimes to produce a spasm of the anus, so that the contraction of the muscles prevents proper movement. When this occurs, the anus may be relaxed by the application of a sponge or napkin saturated with very hot water, or water of a higher temperature may be used for the enema.

The best time for administering the enema is in the morning, after breakfast; but if circumstances will not permit this, the bowels may be moved at night after supper, or just before retiring. With patients who suffer from hemorrhoids or painful ulcers of the rectum, the hour of retiring is the best time for moving the bowels by an enema, as afterward there may be prolonged rest on the

back. This prevents the extrusion of swollen hemorrhoids or prolapsing rectum, and gives rest to the anal muscles, and so prevents the nagging, painful contractions which often follow bowel movement when fistulæ or ulcers are present.

By the systematic use of the cold enema the dilated colon may gradually be restored to its normal size; its relaxed walls will recover their tone, and its function will be more properly performed. When sensibility of the rectum has been lost it may also gradually be recovered. It is necessary, however, that the greatest care should be taken to see that the colon and rectum are never once distended by fecal accumulation. Many persons suffering from rectal constipation take an enema every other day, or once or twice a week, waiting for symptoms of accumulation before the enema is taken. This practice is altogether wrong, and results only in a perpetuation of the disease. Of course, when an accumulation occurs, it must be removed, but if a cure is expected, accumulations must not be permitted to occur.

In obstinate cases the application of a sin-

usoidal electric current to the colon and the rectum aids greatly in the restoration of these parts to a normal condition. By the use of special electrodes electricity may be applied to the interior of the colon, as well as to the rectum, thus securing vigorous contractions of the bowel, which are not always produced by external applications, especially in chronic cases in which the intestine has to a large degree lost its normal sensibility. Very strong electrical applications made to the spine and abdomen sometimes stimulate the muscles of the intestine as well as those of the abdominal wall; but if the intestinal muscles have long been over-stretched and are perhaps to some degree degenerated direct applications are necessary. These must be made by a physician by the aid of the proctoscope, which can be readily passed into the pelvic colon.

Vibration and massage of the interior of the rectum are measures of doubtful value. They are likely to give rise to abrasion and irritation of the mucous membrane, and are not to be recommended.

In cases of rectal constipation in which

painful ulcer or irritable hemorrhoids exist, effort to restore normal action of the bowels may be made ineffective by spasm of the sphincter muscles. This may be relieved temporarily by external applications of heat by means of a fomentation. A very effective plan is to move the bowels while sitting over hot water. Boiling hot water may be poured into a chamber or other suitable vessel. The steam relaxes the anal sphincters, and not only facilitates the bowel movement, but relieves or prevents the pain.

Dryness of the lower bowel due to deficient secretion, the result of chronic proctitis and associated with loss of rectal sensibility, is not infrequently a cause of obstinate rectal constipation. The stools are exceedingly hard and dry, and are discharged with great difficulty. When the rectum of such a patient is examined, the mucous membrane is found to be exceedingly dry, and often irritated. The normal lubricating mucus is not present. The result is the delay of the feces in the rectum until a dry, hard mass is formed, which is not easily gotten rid of. In such cases, lubrication of the rectum is needed.

For this purpose there is nothing so useful as a specially prepared paraffin which melts at a temperature of 102° F., or just above the body temperature. This is heated until it is nearly all melted, by placing the container in hot water. Then with a piston syringe three or four ounces of the warm melted paraffin is introduced into the rectum.

To enable the paraffin to reach the pelvic colon the patient should assume the knee chest position for two or three minutes after the paraffin is introduced and should take deep breaths to encourage the distribution of the melted oil.

Treatment of Spastic or Latent Constipation

In this form of constipation the stools are regular, the bowels move every day, and there is no accumulation of feces in the rectum. The patient is generally unaware of the fact that he is suffering from constipation, although not infrequently an observing patient becomes satisfied that there is something wrong, often because of too frequent bowel movements, which are not uncommon, to-

gether with pain, the passage of mucus, perhaps, and other symptoms.

In a London clinic the writer once heard a Scotch laborer complain of very frequent bowel movement. The examining doctor said to him, "Then you are suffering from diarrhea." "No, Doctor," replied the patient, "I think I am suffering from constipation in diarrhea form,"—a good practical description of certain forms of latent constipation. This patient was found to have a very extensive accumulation of feces due to cancer of the rectum.

In addition to the most thorough-going application of all the measures recommended for simple constipation, a thorough examination, including an X-ray inspection of the whole intestinal tract after a bismuth meal, must be made. The rectum and lower bowel must be carefully examined to exclude cancer or other organic disease. Careful examination must be made in the region of the appendix, and in women a thorough pelvic examination is necessary, since in many cases the delay may occur above the ileocecal valve, in consequence of spasm of the sphinc-



A Spastic Colon. Darkest Portion Shows Dilation of Right Colon—Arrows Indicate Spastic Condition of Descending Colon

ter at this point. Or the delay may be due to incompetency of the ileocecal valve.

The real cause of delay in this form of constipation is to be found in the spastic or contracted condition of the descending colon which results in dilation of the cecum.

When the difficulty is due to spasm of the ileocecal valve, the result of reflex irritation from the inflamed appendix or from inflammation of the ovaries, uterus, bladder, or prostate, or painful disease of the rectum, it is of course necessary that these conditions should be removed by proper treatment. Temporary relief is generally most readily obtained by hot fomentations over the abdomen, with special attention to the seat of pain. The hot sitz bath, the hot enema and the wet girdle covered with mackintosh, worn day and night, are measures of great importance, and often secure very complete and speedy relief.

When the intestinal inactivity is the result of general feebleness, short cold baths should be employed daily. A cold bath may consist of a general cold shower of from fifteen to twenty seconds' duration, a cold douche to the spine, a cold towel rub, or cold sheet rub,

according to the strength of the patient. The cold bath should be preceded by a short electric light bath. It aids in the elimination of accumulated toxins, and prepares the skin to react to the cold application.

In spastic constipation, the enema is sometimes useful chiefly as a means of introducing water by which the accumulated toxins may be washed out through the kidneys. In such cases the difficulty lies too high to be reached by the enema. The large cool or cold enema may, however, render service in cases in which the delay is due to atony, by improving the tone of the bowel muscles and so aiding peristaltic movement, by which the accumulated putrefying material in the lower part of the intestine may be moved on to the colon, and so be gotten rid of. The cold enema should not be used, however, in cases where there is reason to suspect spasm of the ileocecal valve, which is likely to be the case when latent constipation is associated with painful disease in any part of the pelvic region. In these cases a hot enema should be employed.

The rapid absorption of water from the

colon is shown by the copious discharge of urine which usually appears within a few minutes after an enema is taken. The increase in the quantity of urine occurs so quickly after a large enema, that some medical writers in the early part of the last century were led to advance the theory that a direct connection existed between the colon and the kidneys. This fanciful theory has, of course, no anatomical foundation.

Mechanical kneading, the application of the sinusoidal current, and intelligently administered massage and other means by which success may be attained in combating latent constipation are useful measures.

In the treatment of these cases it is to be remembered that while the principal seat of stasis is the right side of the colon, the cecum and the ascending colon, which by dilatation have become converted into a cesspool which is rarely ever completely emptied, the primary seat of disease is to be found in the left side of the colon. The descending and often the pelvic colon are in an almost constant state of spasm, so-called spastic condition, and so long as this condition exists, little headway

can be made toward relieving the condition of the right side and the autointoxication arising from it.

In many cases of so-called spastic constipation, this condition is only a complication of colitis or chronic infection of the colon, due to delay of fecal matters in the colon.

The best means of securing immediate relief in cases of this sort are the hot sitz bath, the hot enema, and hot fomentation or diathermy applied over the abdomen.

In cases of painful disease of the ovaries or uterus, the hot vaginal irrigation must be used in addition to the hot enema.

Sometimes the warm oil enema proves more serviceable than the hot water enema, because less irritating. The addition of salt to the water is sometimes useful in cases in which the mucous membrane of the intestine is eroded, as a weak solution of salt is less irritating to raw surfaces than pure water.

The application of the arc light and the photophore are extremely useful means of relieving the internal spasm. These applications should be made daily for ten to fifteen minutes' duration. In severe cases the light

applications may be intensified by a special device through which the excessive rise of temperature is prevented by a stream of cool air or water playing upon the abdomen.

When making general cold applications, the abdomen should be protected by a warm flannel or a hot fomentation. A patient suffering from constipation must take special care to avoid chilling, and must keep the feet and hands warm. The chilling of the hands and feet always aggravates the spasm. The drinking of ice-cold water must also be prohibited.

The cold towel rub is especially suited to these cases, as a general tonic measure.

A person skilled in massage may make good use of this measure in the general application of heat, in cases in which massage is indicated, as when the cecum is loaded as the result of contraction of the transverse colon, or at the splenic flexure. The tendency of massage to aggravate the contraction is counteracted by a general application of heat.

The moist abdominal bandage without the mackintosh cover should be worn at night and if possible also during the day time.

The abdominal supporter is also highly important in these cases, to prevent drag upon the mesentery by prolapse of the bowels. The writer has observed several cases in which the wearing of an efficient abdominal supporter has given prompt relief from very obstinate constipation.

The Treatment of Mixed Cases of Constipation

In many, perhaps the majority, of cases of constipation, the type of the disease is mixed. The association of spastic constipation with latent or cumulative constipation is specially common. Cases which begin as simple constipation, later become cumulative constipation, and finally develop spastic or latent constipation through infection of the colon, or colitis, the natural result of stagnation of the bowel contents.

The measures recommended for the treatment of spastic constipation should be applied with such other measures as may be indicated. If the rectum and the pelvic colon are filled with feces, these must be removed by the means recommended in the treatment

of rectal constipation, and the general measures suggested for the relief of that form of the disease must be perseveringly employed.

In the use of electricity in cases of this sort, the applications must be combined with hot applications, in order to avoid increase of the spastic contraction.

When electricity is applied to the rectum, a fomentation should be applied to the abdomen during the application, or immediately afterward.

The thermophore affords the most effective means of applying heat to the abdomen during electrical applications. During a general cold application heat should be applied over the abdomen, to protect the intestine.

A flannel bandage should be worn over the abdomen constantly when the moist abdominal bandage is not employed, and an abdominal supporter should be worn.

Coarse vegetables and other bulky food-stuffs should not be avoided because colitis is present. Colitis is the result of constipation, and this will be aggravated by the bland concentrated diet which is commonly recommended for colitis. Experience has very

clearly demonstrated the value of a bulky diet in colitis as well as in constipation.

Agar-agar is specially valuable in these cases, for the reason that it affords bulk, and aids in clearing away the accumulated mucus, while at the same time producing no irritation. The irritation supposed to rise from the cellulose of fruits is far less than is generally thought. Bran and ground wood have been used with excellent results as poultices for raw surfaces and dressings for wounds. Wet bran, like wet paper, is not irritating.

TREATMENT OF DISORDERS WHICH RESULT FROM CONSTIPATION

While constipation, through the autointoxication to which it leads, is both an exciting and predisposing cause of many very serious chronic diseases from which human beings suffer, there are many other maladies which are so immediately aggravated by an inactive state of the bowels, that this condition becomes a dominant factor in dealing with them. In this chapter a brief mention will be made of the more important of these diseases.

Catarrhal Colitis

The chief seat of this disease is the lower colon, especially the pelvic colon and the iliac colon. Sometimes, however, the effect extends to the entire colon.

The disease is essentially a chronic infection of the mucous membrane, and is the result of the injury done to the tissues by the prolonged contact with putrefying fecal mat-

ters which in constipation accumulate and are often retained for days in the lower colon. To understand the effect of these poisonous matters upon the mucous membrane, when acting continuously for days with constantly increasing virulence, it is only necessary to consider for a moment what result would follow an application of the same sort of material to the skin for several days in succession. The remarkable vitality with which the mucous membrane is endowed, enables it to retain its integrity for a considerable length of time; but sooner or later its resistance breaks down, and it becomes the seat of a chronic inflammation similar to that which affects the mucous membrane of the nose in nasal catarrh. An examination of the stools shows constantly present mucus and white blood cells, which are thrown off by the mucous membrane in its efforts to defend itself against the attack of the myriads of microbes which are constantly assailing it, and the various highly virulent poisons which they produce. The character of these poisons may be judged from the nauseous odors emanating from the putrefying feces which are discharged when

a laxative is administered, and sometimes as the result of an enema. The real character of the feces produced by a constipated person cannot always be judged by an examination of the hard, dry masses which are discharged from the lower bowel, for the reason that the noxious substances which they contained have been absorbed higher up in the bowel.

The frequent bowel movement in colitis is due not only to the irritation produced by the stagnation of fecal contents but to the fact that the contracted bowel relaxes at intervals and permits the passage of material which has been accumulated above it. When the bowel is completely contracted the obstruction is complete. In examining the patients suffering from colitis the writer has often noticed the complete relaxation of the bowel which but a few moments before was so contracted that it could be rolled under the finger like a piece of thick rubber tubing.

In catarrhal colitis, the stools may be either liquid, or composed of hard lumps somewhat resembling the feces of goats, or they may be mixed in character. The stools are sometimes quite watery in character, and

may contain traces of blood. Patients often think that they are suffering from diarrhea, on account of the frequent semi-liquid discharges. The cause of liquid stools is the irritation produced by the hardened and irritating feces. The irritation is not mechanical, however, but is due to the poisonous and irritating substances which are produced by the bacteria growing in the feces, in other words, by the putrefaction which is taking place.

In many cases there is a quite regular alternation of constipation and diarrhea; the feces accumulate for several days, when the irritation becomes so great that a profuse flow of serum and an abundant secretion of mucus occurs, the mass is softened, and temporary relief is obtained through the complete or partial unloading of the bowels by several soft stools.

This condition is always associated with cecal or right-side constipation, and with a spastic contraction of the bowel. The most common seat of this contraction is the descending or pelvic colon; but it may often be noted in the transverse and ascending

colon. In these cases, the autointoxication which is always present is more pronounced in degree, because of the more fluid character of the intestinal contents in the upper bowel. The disease not infrequently extends to the whole colon as is shown not only by the contracted condition of the ascending colon and even of the cecum, but also by the presence of masses of hardened feces which may be frequently felt in both these portions of the colon.

The ultimate effect of long-continued inflammation of the mucous membrane is the same in the colon as in the nose and other parts provided with a mucous lining. After a time, which varies according to the resistance of the individual and the intensity of the disease, degenerative changes occur in the mucous membrane; its glands disappear, and it becomes thin and parchment-like. The degeneration extends to the muscles which lie beneath the mucous membrane. The intestinal wall is thus thinned and weakened and loses its power of contractility to a large degree; it becomes distended and enlarged by gases and fecal accumulation, and thus

the difficulty becomes greatly aggravated. The colon becomes much like a greatly distended bladder, losing a large part of its functions as a living muscular tube; it fails to respond to the nervous impulses by which the act of defecation is normally affected and serves merely as a reservoir in which accumulate waste and remnants of undigested and undigestible foodstuffs, there to remain undergoing fermentation and putrefaction, developing offensive gases and irritating poisons, until removed from the body by some mechanical means. In these cases an essential part of the defecating mechanism is practically destroyed or rendered inoperative, and it becomes necessary to resort to mechanical means, as an enema of water or oil, for emptying the bowels. Lane and other surgeons have removed the colon in these cases, an operation which is doubtless sometimes necessary, although less often required than has been advocated by some, provided the patient can have the benefit of a complete regulation of the dietary, and will follow a suitable regimen. In all cases the flora must be changed.

The disastrous consequences which result from chronic catarrhal colitis are not confined to the colon. The disease often extends to the small intestine. In aggravated cases the accumulation in the cecum becomes so great that the ileocecal valve is dilated to such an extent that the contents of the cecum and small intestine intermingle. The very perfect valve arrangement provided by Nature at the junction of the small intestine with the colon, which is rendered still more effective by a sphincter muscle placed just above it, is evidently intended to prevent any possible return of matters from the colon to the small intestine. In the small intestine the presence of carbohydrates prevents the growth of putrefactive organisms, by encouraging the formation of acids. In the colon, however, especially when there is stasis or accumulation of fecal matters, the delay permits the complete absorption of starch and sugar, so that there is no material to encourage the acid-forming bacteria; and the poison-forming microbes, being unhindered, undergo rapid development, and greatly increase in virulence, finding always plenty of food ma-

terial in the mucus, bile, and other intestinal secretions, as well as the larger or smaller quantities of food protein which remain undigested or unabsorbed. When these dangerous microbes are carried into the small intestine they may continue to develop and gradually work their way up the intestine.

The cecum becomes dilated and distorted in shape, because of the weakening of its walls in consequence of the undue accumulation of its contents. The cecum may be so dilated and stretched that it is found far over toward the left side of the body, or lying deep down in the pelvis. The damaged ileocecal valve no longer controls the opening between the small intestine and the colon. The feces are no longer found exclusively in the colon. The small intestine may for several feet be filled with fecal matters of the consistency of putty, such as are normally found only in the transverse colon and beyond.

Putrefaction of the contents of the small intestine is a very much more serious matter than putrefaction in the colon, for the reason that the small intestine is much more richly supplied with absorbents, and is also less pre-

pared to defend itself against the attacks of the virulent microbes which are always present in connection with putrefactive processes.

This infection of the small intestine with fecal matters introduces a whole series of troubles which unfold as the infection ascends along the intestine. The ascending infection finally reaches the duodenum, which not infrequently becomes the seat of a chronic catarrhal condition, the result of which may be ulceration. Observations of Moynihan and others have shown that duodenal ulcer is three or four times as frequent as ulcer of the stomach. Pain occurring three or four hours after meals is very frequently due to duodenal ulcer. From the duodenum, infection often travels through the bile ducts to the liver and the gall bladder. Chronic infection of the gall bladder and gall stones are thus developed. The infection may also ascend the pancreatic duct, which is closely associated with the bile duct, and may cause chronic inflammation of the pancreas, one of the results of which may be diabetes. From observations recently made respecting the causes of diabetes it is probable that inflam-

mation of the pancreas arising in this way is one of the most common causes of this disease. Observations made in the X-ray department of the Battle Creek Sanitarium indicate that the ileocecal valve is usually incompetent in diabetes. This is a most significant fact. The ileocecal valve protects the small intestine from infection; when it becomes incompetent, there is nothing to prevent the development of an ascending infectious process, which may bring about all of the conditions above mentioned.

Treatment

The successful treatment of colitis requires, first of all, a change of the intestinal flora; that is, the infectious bacteria to which the disease is due must be gotten rid of. Since the first cause of colitis is constipation, it is evident that frequent bowel movement is also essential; in other words, the colon must be kept clean. The diarrhea which is sometimes present in colitis is the result of Nature's effort to clear the intestine from offending materials. The mucus which is often discharged in large quantities is a protective

material which Nature pours out upon the surface of the intestine to protect the tissues against the attacks of bacteria and parasites which flourish in the colons of persons suffering from this disease.

Various species of bacteria are capable of giving rise to colitis, according to Tissier. In general, it may be said that colitis is the result of the presence in the colon of excessive numbers of putrefactive bacteria.

In recent years, attention has been called to the fact that acute infections of the colon are sometimes due to animal parasites. Certain amoebæ, flagellates, spirochetes and other forms of protozoa are also found in great numbers in the colon in cases of chronic constipation and colitis, as well as in cases of amoebic dysentery. These organisms have been regarded by most authorities as pseudo parasites, with the exception of those of amoebic dysentery. Dr. Ronald Ross has recently pointed out the fact that all these organisms are parasitic and dangerous. If they do not set up the acute inflammation characteristic of amoebic dysentery, they bore into the mucous membrane and thus pre-

pare hiding places for pernicious bacteria, which develop chronic infections and intestinal toxemia. Observations made a few years ago in the laboratory of the Battle Creek Sanitarium show that these animal parasites are rarely found in the stools of persons who subsist upon a non-flesh dietary. They abound in feces which are in part made up of undigested residues of flesh foods.

The measures necessary for the treatment of colitis are comparatively simple and by their thorough application practically all cases are curable. Only in its advanced, ulcerated stage does the disease sometimes become incurable.

As already stated, it is necessary in the treatment of colitis first of all to adopt thoroughgoing measures to secure a change of the intestinal flora. The writer has found that this may be accomplished in a short time by placing the patient on a special diet, which for convenience is termed a fruit regimen. For a description of this regimen see Index. After a few days of this regimen (three days to a week) the character of the stools will be found to be wholly changed. The stools be-

come soft, almost odorless and frequent, the tongue clears, the appetite is keen and is satisfied with simple foods. Cereals and a moderate amount of fats can now be added to the bill of fare, but the fruits, bran, and paraffin must be continued.

The diet must be made so bulky and laxative that the bowels move three or four times a day. Four movements a day are better than three. The stools should be odorless or they may have a slight sour odor. An ammoniacal or putrid odor is evidence that the flora has not yet been changed, and the fruit regimen must be continued or repeated after a few days. Sometimes several repetitions of the regimen at intervals of a few days are required for complete success. In bad cases animal products of all sorts must be avoided. Even milk must be excluded, as well as eggs and meat. As pointed out by Tissier some years ago, the bacteria which produce colitis thrive best upon animal protein.

In addition to the above, there are several other highly effective measures which may be advantageously employed in the treatment of colitis. Notwithstanding the free use of bran

or agar-agar and paraffin, the colon may be so crippled that it does not completely empty itself and a sufficient amount of material is constantly left behind to encourage putrefaction, and to prevent the healing of the diseased surfaces. Examination with the X-ray shows in these cases a spastic, or contracted, condition of the descending or pelvic colon, and in many cases a prolapsed condition of the pelvic colon, which may be adherent. In these cases, the colon must be daily washed out by means of an enema consisting of two or three pints of salt water. The temperature of the water should be 105° to 108° F. The enema should be repeated several times, or until the water returns clear. The effectiveness of the enema is greatly increased by thorough massage of the colon, especially of the pelvic colon, with the patient in the knee-chest position. When the pelvic colon is distended by the enema it may be manipulated more effectively.

After the colon has been thoroughly emptied, an injection is made consisting of a culture of *Bacillus Acidophilus* in whey, to which has been added a small portion of well

boiled starch and also a small quantity of malt sugar. By this means the colon is inoculated with protective germs; in other words, a new flora is planted and supplied with the material to promote its growth and development, and to help reform the wild bacteria of the colon to which colitis is due.

The diet should be not only strictly anti-toxic, excluding meats of every kind, but must include liberal tri-daily doses of lacto-dextrin. For prompt and definite results the patient should adopt all the measures elsewhere indicated for changing the intestinal flora. In bad cases the maximum dose, three or four ounces, must be continued for several weeks or until mucus disappears from the stools and the stools are no longer putrescible. When possible, a bacteriological examination should be made to make certain a thorough change of flora has been accomplished. Lacto-dextrin must be used in smaller doses, one or two ounces three times a day, for several months after the flora has been changed, and in many cases the continuous use of lacto-dextrin is not only desirable but necessary to prevent relapse.

Proctitis

The infection known as colitis very often extends from the pelvic colon into the rectum. When the rectum is involved, the patient often suffers from more or less constant pain and uneasiness in this region; there may be frequent desire to move the bowels, but however frequently the bowels may be moved, there will always be some feces remaining in the rectum, together with mucus and, occasionally, blood. An examination of the rectum sometimes shows ulceration. In advanced cases, the mucous membrane is smooth and dry, with patches of mucus adhering here and there, and frequently raw surfaces which bleed when touched. The conditions are identical with those which are found in the bowel higher up. The point of junction of the colon and the rectum is a favorite seat for ulcerations and thickenings of the mucous membrane.

When the disease extends deeper into the wall of the bowel, as it does sooner or later, thickening and rigidity result. By extension of the disease through the membranous wall,

the outer surface becomes inflamed, and adhesions may occur between the lower bowel and the bladder, which sometimes result in fistulæ between the two viscera. Adhesions may also occur between the colon and small intestines and other parts; the ulcerations may heal and form cicatrices, which contract and produce obstruction. The lower part of the rectum and the juncture of the colon and rectum, the pelvi-rectal valve, usually show the worst effects of catarrhal colitis, and these points are the favorite seat of cancerous growths. The long continued irritation to which these parts are subjected also leads to the development of other growths, which, together with ulcerations, as has been shown by Mummery, a very eminent London specialist, are very prone to develop into cancer, and on this account, every person who suffers from catarrhal colitis, as shown by the presence of mucus in the stools, should submit himself to a physician for examination in order that any existing tendency towards malignancy may be recognized sufficiently early to permit of its radical treatment.

The treatment of proctitis is essentially the

same as that already outlined for colitis. Change of the intestinal flora, frequent bowel movements, daily cleansing of the colon, an antitoxic diet, and the introduction into the colon of cultures of lactic-acid-forming organisms are the most important measures. Faithful employment of these measures will usually effect a cure.

Muco-membranous Colitis

This disease is probably only a variety of the preceding. Of this the writer has been convinced for many years, although most authorities still describe this malady as a nervous disorder. The only particulars in which it differs from catarrhal colitis are:

1. The fact that mucus is not constantly present in the stools as in catarrhal colitis.
2. The presence of membranes which are sometimes complete casts of the bowel, and may be a foot or more in length.
3. Colic pains.
4. Intermittent occurrence of the symptoms.

These differences are not sufficient to characterize this condition as a distinct disease.

Constipation is the predisposing condition which lies back of this disease, as well as of catarrhal colitis. If the infection is not sufficiently intense to produce continuous symptoms, it is only necessary that it should be increased by some indiscretion in diet, exhaustion, a severe cold, or some other factor, to precipitate an attack. The casts consist of coagulated mucus, and not mucous membrane as patients often imagine. The colic pains are due to violent contractions of the colon, which are excited by the accumulation of gas and irritating fecal matter. This disease is often associated with chronic affections of the pelvic organs.

The treatment of this condition does not differ from that already outlined for the treatment of colitis. Medicinal laxatives of all sorts must be avoided, because these only serve to aggravate and perpetuate the disease. Indeed, the use of laxatives, mineral waters, etc., is one of the most common causes of this condition. This is true of medicinal laxatives of every description. This fact alone is sufficient to condemn the use of these drugs except for temporary effect in emergency.

Muco-membranous colitis as well as ordinary colitis can be thoroughly cured only by changing the intestinal flora. (See Index).

Enlargement of the Liver and Spleen

Marked enlargement of the liver and spleen are frequently the result of chronic constipation with intestinal autointoxication. The constant flooding of the liver with toxins must result in damage to its tissues. Boix showed this in his experiments upon rabbits. Some years ago the writer encountered a case of enormous enlargement of the liver, in which there had never been any use of alcohol, but constipation which had existed for many years. Change of the intestinal flora is essential. Lacto-dextrin will change the flora and aid the liver to repair itself. Meats must be scrupulously avoided and lacto-dextrin should be used continuously for some months.

Fecal Tumors

When the obstruction which causes a delay in the movement of feces through the colon is permanent, the mass of accumulated feces may attain such a size as to be easily

felt through the abdominal wall. Fecal tumors may generally be distinguished from other tumors by their doughy consistency, that is, their shape may be moulded by pressure with the fingers. Such tumors sometimes disappear suddenly and may be broken up by the manipulation of the hands, or softened by means of enemata of warm water or warm oil. Sometimes a surgical operation is necessary for their removal.

The late Dr. Lawson Tait told the writer of a case to which he was called to operate for the removal of a large abdominal tumor, which proved to be a tumor of this sort. On opening the abdomen, the small intestine was found to be enormously distended just at the ileocecal valve. On inquiry, it was found that the patient, who was recently convalescent from typhoid fever, had swallowed rather rapidly a large quantity of milk. Suspicion at once arose in the mind of the surgeon that the mass might consist of undigested curds. With this idea in mind, he carefully manipulated the tumor with his fingers, and finally succeeded in breaking up the mass to such a degree that it became possible to push the fragments

through the ileocecal valve, and thus a more serious operation was avoided.

Volvulus

Sometimes the processes which begin in the intestine and work outward through the intestinal wall give rise to inflammatory changes in the membranous fold of mesentery to which the pelvic loop of the colon is attached. As a result the mesentery is gradually shortened until the ends of the loop are brought close together and fixed. With the colon in this position, there is a great risk of obstruction from the twisting of the loop, which occasionally happens, giving rise to what is known as volvulus. In a case of this kind prompt surgical relief is very essential. A short delay may give rise to gangrene of the intestine, and general peritonitis.

Disorders of the Stomach

Although located at the other extremity of the digestive canal from the colon, the stomach is, nevertheless, in various ways and to a profound degree influenced by chronic constipation. Loss of appetite is a very common

symptom in constipation, and so constipation is increased through the lack of the vigorous stimulation given to the movement of the intestine by the taking of food with relish.

Most gastric disorders are the result of stagnation of food residues and putrefactive changes in the colon and disappear when the flora is changed and the bowels made to move efficiently three times a day.

Diseases of the Heart and Blood Vessels

Palpitation of the heart is a common consequence of an acute accumulation of feces in the colon, probably the result of the excessive absorption of toxins to which such accumulations give rise.

Pseudo-angina pectoris, in which the patient suffers pains in the region of the heart entirely similar to those which occur in angina pectoris, is frequently associated with chronic constipation. Chronic constipation or the autointoxication resulting from it may be regarded as a cause of true angina pectoris as well as of pseudo-angina. Arteriosclerosis affecting the vessels of the heart has been clearly shown by Bouchard and other author-

ities to be one of the common results of chronic constipation, and attacks of angina pectoris often appear among other symptoms of the degenerative changes which have taken place. Years ago Boix, of Paris, showed that the poisons produced by the colon bacillus are capable of producing these degenerative changes which result in sclerosis of the arteries of the liver, spleen, and other glands.

Premature Senility

The senile appearance of many persons who have long suffered from chronic constipation, as well as the steady decline of longevity in countries in which constipation is prevalent, is evidence of the mischievous results of the constant absorption of the poisons produced by colon germs which Metchnikoff regards as the cause of old age. The pigmentation of the skin appearing first about the eyes and as brown spots upon the hands, the thinning of the skin of the hands and parchment-like appearance of the skin are familiar symptoms of senility induced by alimentary toxemia. It is highly important to note that these senile changes are not confined to the skin.

The changes in the skin are only the external signs of similar degenerative changes taking place in the blood vessels, liver, kidneys, and other vital internal parts.

Disease of the Kidneys

The poisoning resulting in chronic constipation is frequently indicated by the appearance of albumen and casts in the urine. A long continuance of this poisoning gives rise to changes in the kidney, which are commonly known as Bright's disease. It is indeed quite possible that chronic constipation may be one of the most important of all causes of this terrible malady. Statistics of all civilized countries show that Bright's disease is increasing very rapidly. At the present time the number of persons dying of renal disease in the United States is 130 per cent greater than thirty years ago. In certain cities the proportion is still higher, the increased mortality rate from this cause amounting to 164 per cent. The large use of meat in connection with this condition of constipation greatly aggravates the evils arising from this condition, because meat not only affords the poison-forming bac-

teria just the sort of material they require to promote their growth, but also introduces into the intestine in large numbers the most virulent forms of putrefactive bacteria.

Suppuration of the kidney, shown by pus in the urine as well as by local pains and other symptoms, is usually associated with chronic constipation. Infection of the kidney with colon germs may occur through the urinary tract, the germs travelling by the ureters to the kidney, or direct infection may occur. The bacteria which grow in the intestines, especially when their virulence is increased by stasis or stagnation, readily penetrate the walls of the intestine and adjacent organs. The right kidney lies in immediate proximity to the colon.

Bacteriological examination of the urine in cases of suppuration of the kidney often shows the presence of colon germs.

Regulation of the diet is the first thing to be done in every case of disease of the kidneys. The dietetic measures adopted should be such as will lessen the amount of work required of the kidneys to the greatest extent possible. Tea, coffee, meat extracts, bouillon,

as well as meats of all kinds, must be rigorously excluded from the diet and the most thorough-going measures must be adopted for changing the intestinal flora and securing complete and thorough evacuation of the bowels three or four times a day. In many cases the daily use of the enema for weeks or even months is advisable to make certain that the colon is completely emptied. Lactodextrin must be used in such quantities as to suppress completely putrefaction in the colon. *Acidophilus* buttermilk may be advantageously used in many cases.

Disease of the Liver and Gall-Bladder

Recent observations have shown that when putrefying feces accumulate in the colon great numbers of bacteria pass through the walls of the intestine into the branches of the portal vein, and are carried to the liver. The liver destroys many of these bacteria, but not a few of them pass out in the bile, and thus infect the bile passages of the liver and gall-bladder. It is possible, also, that infection may occur directly from the intestine. The bacteria may ascend the gall ducts to the gall-

bladder and the liver. Modern research has shown that gall-stones are always due to bacteria, which are found in the interior of the gall-stones. Persons suffering from disorders of the gall-bladder, and from gall-stones, are always chronic sufferers from constipation and alimentary toxemia, to which unquestionably their liver troubles are chiefly due.

Diseases of the gall-bladder are generally due to infection and the source of infection is usually the colon. Recent observations have shown that pernicious bacteria which develop in a neglected colon readily ascend to the stomach and even to the mouth. It is evident, then, that in these cases thorough change of the intestinal flora and the application of measures necessary for thorough frequent evacuation of the colon are of first importance. Recent observations made by a French physiologist indicate that by the free and prolonged use of carbohydrate (lactose or lacto-dextrin) a damaged liver may be aided to repair its injured cells and recover its efficiency.

Insomnia

One very rarely finds a person suffering from insomnia who is not constipated. Not infrequently, the constipation is present in the latent form, and its existence may not be suspected. Examination of the stools and inspection of the tongue give clear evidence of the existence of stasis in the colon. The insomnia is due to the irritation of the brain cells produced by the poisons with which the blood is saturated through absorption from the colon. The use of soporifics only secures temporary relief with a certainty of making the patient worse through disturbing his digestion, destroying his appetite, and thus making his constipation worse. By relief of constipation through proper diet, and the adoption of other rational measures the insomnia may be made to disappear, and usually with very great promptness.

Most cases of insomnia are accompanied by intestinal stasis or some form of constipation. Insomnia may be not only a result of constipation but a cause of aggravation of this condition through spasm of the descending

colon which frequently results from the nervous conditions which follow loss of sleep. The coated tongue and offensive breath which usually accompany insomnia indicate the presence of auto-intoxication and the necessity for the application of thoroughgoing measures for change of the intestinal flora. Fortunately, this may be readily accomplished by the use of lacto-dextrin or acidophilus buttermilk, either one alone or in combination, and this measure should never be neglected in cases of insomnia but should be used in connection with thoroughgoing means for increasing intestinal activity. Hundreds of cases of most obstinate insomnia have been treated with entire success by these simple but efficient methods.

Headache

This very common and most distressing effect of chronic constipation is due to putrefaction poisons absorbed from the colon, and constipation quickly disappears when the intestinal flora is changed and the bowels made to move well three times a day. Copious water drinking, especially drinking two or

three glasses of hot water two or three times a day, ameliorates the symptom by aiding the elimination of poisons. Attacks of migraine are always preceded by an increase of stasis, that is by an accumulation of fecal matters which throws into the blood a new flood of indican and other toxins. By a thorough emptying of the colon through the use of the enema the attack may always be mitigated and sometimes averted. If the attack has actually begun, however, the result is less satisfactory although even then the duration of the attack, if not its intensity, may be lessened by emptying the colon by repeated enemas. When vomiting or nausea is present, the enema should be repeated several times a day as a means of introducing much needed fluid. An excellent plan is to introduce into the colon to be retained and absorbed half a pint to a pint of water every hour or two.

The excruciating pain of migraine may be made more endurable by fomentations or alternate hot and cold applications to the painful parts. The use of morphia and other narcotic or pain-relieving drugs is most pernicious. The use of drugs merely purchases

present relief at the expense of increased future suffering. Such drugs increase the constipation and so aggravate the toxemia and not infrequently a drug habit is formed.

Most headaches are toxic and the source of the toxin with few exceptions is to be found in the colon; hence the efficient remedy for chronic headache is to be found in change of the intestinal flora; that is, the suppression of intestinal putrefaction by training the colon to normal activity, which is complete evacuation of its contents three or four times a day. Lacto-dextrin should be used in liberal doses as directed for changing the intestinal flora until the headaches disappear. As the stools become less putrid and as the tongue clears and the malodor of the breath disappears, headaches will lessen in frequency and severity and by a persevering effort a permanent cure may be accomplished.

Rachitis, Arrest of Growth and Other Disturbances of Nutrition in Infants

The researches of Combe and Rouget have clearly shown the relation of intestinal intoxication to the arrested growth and other dis-

turbances of nutrition which are frequently observed in infants and young children and that constipation lies at the foundation in most of these cases. One of the most important of all the duties of the nurse is to attend carefully to the condition of the infant's bowels, as neglect in the first weeks of infancy may lay the foundation of troubles which years of painstaking efforts will be required to relieve, and which may be irreparable.

Cancer

The discoveries of Ross respecting the cause of cancer show very clearly the reason for the special frequency of cancer in the pelvic colon and the rectum. According to Ross, cancer is due to an abnormal stimulation of the processes of normal cell growth. He has shown by elaborate laboratory researches that cholin and cadaverin, two of the products of the putrefaction of flesh or protein, are powerful augmenters of cell action, and in recent experiments he has been able by these poisons to produce in guinea pigs growths which have all the characteristics of cancer. Certainly no part of the

body is more exposed to the influence of these putrefactive products than is the lower bowel. It is evident, then, that this portion of the body should receive prompt attention on the occurrence of the slightest symptoms of disease, and that as a protective measure putrefaction of the feces should be prevented by proper regulation of diet and of the bowel movement.

The writer has no doubt that suppression of putrefactive changes in the colon, in other words, change of the intestinal flora, will ultimately be found the most effective means of preventing cancer of this region of the body. The facts of experience certainly point very strongly in this direction.

Cancer is an exceedingly common disease in all carnivorous animals and is, on the other hand, rare in non-flesh-eating animals. This fact is observed in relation to human beings. Cancer is practically unknown among people who rarely eat flesh. The principal harm which results from flesh eating is due to the putrefaction in the colon of the undigested residues. Putrefaction is encouraged by flesh eating not only because of the great facility

with which animal flesh undergoes putrefactive changes but because of the fact that flesh as usually eaten is already in a state of well advanced putrefaction and hence becomes an active source of infection of the intestine. Persons who are predisposed to cancer should take great care to maintain a non-putrefactive intestinal flora by the free use of acidophilus buttermilk or lacto-dextrin or both of these protective foods. The same should be said of persons who have developed cancer in any other part of the body. Every person who has been operated upon for cancer should give great attention to changing the intestinal flora and the maintenance of normal activity of the bowels. The bowels should move three or four times a day and an enema should be used when there is ground for suspicion that the colon is not thoroughly emptied.

Tuberculosis of the Bowels

Intestinal tuberculosis appears to be increasing. That this should be the case is not surprising; in view of the fact that constipation is becoming more and more prevalent

each year. The contact of poisonous fecal matters with the mucous membrane lowers its resistance and renders it susceptible to the infectious influence of the tubercle germ. All forms of tuberculosis, as the history of cases shows, are almost invariably preceded by chronic constipation for a prolonged period.

Change of flora is most important not only as a means of combating the local infection, but to increase the general resistance. Meats of all sorts must be avoided. With these helps, under favorable conditions, many cases will recover. Rollier has shown the great value of sunlight in these cases.

Backache

Aside from symptoms which relate to the rectum, backache is perhaps the most common of all local symptoms arising from constipation. In women this symptom is usually attributed to disease of the womb or ovaries. It is safe to say that in by far the larger number of cases the pain is due not to disease of the organs peculiar to women, but to a diseased condition of the colon, set up by long continued contact with putrefying fecal mat-

ters. In many cases tender points can be felt by deep pressure along the iliac or the descending colon. Sometimes the pelvic colon may be located. By the aid of the X-ray and the fluoroscope it is possible to locate and make pressure upon every part of the colon, as well as to note its form and size, and thus the presence of disease may now easily be located when present.

The pain is reflex in character, and may often be produced by pressure upon a contracted and tender part of the colon. Pains over the sacrum are quite as often due to disease of the rectum as to disease of the uterus or ovaries. As constipation is so constantly associated with disease of the pelvic organs, it is a question of interest whether the pain usually attributed to pelvic disease, when this is present, may not in many cases be really due to disease of the colon or rectum. Tender spots in the lower part of the back are usually due to the same cause, and only rarely indicate disease of the spine.

The congestion of the abdominal organs which results from chronic constipation is the cause of a great variety of reflex pains in

the back and sides. Coldness, numbness, prickling and creeping sensations, and points of tenderness in the abdomen, a sense of weight, dragging and pressure, are only a few of the distressing symptoms which arise from visceral congestion due to the absorption of toxins from the intestinal tract, and the infection of the intestinal mucous membrane resulting from chronic constipation.

Exophthalmic Goiter

This serious disorder, which is becoming constantly more common, is in many cases due to chronic intestinal poisoning, and hence may be the result of constipation, which in some form is always present in cases of chronic intestinal autointoxication. To treat this malady simply by removal of a part of the thyroid gland by a surgical operation, or by partial destruction of the gland by the X-ray without giving attention to its cause, is certainly irrational, since the enlargement and activity are the effects, no doubt, of the absorption of toxins from the intestinal canal. The gland enlarges because of the extraordinary amount of work demanded of it, its

special function in the body being to aid in the destruction of poisons, especially those developed in the intestine by the decomposition of protein. Animals whose thyroids have been removed soon develop convulsions and die when fed on a meat diet, but thrive indefinitely on a diet which excludes meat.

The writer has seen numerous cases of hyperthyroidism, or exophthalmic goiter, make excellent recoveries without operation by rest, a strict antitoxic diet and change of the intestinal flora. These measures are preventive as well as curative. Every person who has undergone an operation for relief of exophthalmic goiter should change the intestinal flora and maintain a thoroughly good flora by the use of lacto-dextrin and the avoidance of meats of all sorts.

Myxedema

A disease which is the antithesis of exophthalmic goiter, myxedema, is really due to the same cause. The thyroid gland becomes worn out by excessive work, and its function is lost. In consequence, the whole body suffers from peculiar degenerative

changes. The skin and hair become dry, pale and sodden in appearance, the speech is thick, the expression is peculiar and characteristic, and the intellect is dulled. The cause of this peculiar disease was wholly a mystery until the function of the thyroid was discovered. It is now known to be due to the failure of this important gland to do its work, as the result of degeneration, which is in most cases the result of the excessive work imposed upon it by the autointoxication induced by a high protein diet—the free use of meat and eggs, especially when associated with constipation.

Hypothyroidism, incipient myxedema, is a very common malady. The thyroid is less active than it should be though its function is not wholly lost. Dryness of the hair, falling of the hair, and dryness of the skin are common symptoms of this condition seen associated with chronic constipation, and the natural result of long overwork of the thyroid in destroying colon poisons. Change of the intestinal flora and the maintenance of a non-toxic condition of the intestinal contents are equally important measures in cases of myxedema as in cases of hyperthyroidism.

Chronic Rheumatism and Rheumatic Gout —Osteo-Arthritis

Both of these diseases are closely associated with constipation and alimentary toxemia. Herter showed that certain putrefactive organisms are always present in great numbers in the stools of persons suffering from rheumatic gout. The experience of many physicians has shown that great improvement often follows the adoption of a low protein diet in these cases; and the benefit derived from securing increased activity of the bowels has made many a mineral spring famous as a cure-all for rheumatics.

While chronic rheumatism, rheumatic gout, or osteo-arthritis, are sometimes due to focal infections located in the mouth, there is little room for doubt that the dominating factor in most of these cases is to be found in the colon. The mouth infections are probably in many cases secondary to colon conditions which have reduced the general resistance of the body. The diseased colon is itself the most important of all focal infections. Certainly, change of the flora and training the

bowels to normal activity with a non-toxic diet are the measures which accomplish more relief of chronic rheumatism than any other measures or, in fact, all other measures combined.

Pigmentation of the Skin and Skin Diseases

When meat and eggs are eaten freely, according to Combe, there may be produced in the intestine a large amount of a brown poisonous coloring substance, "brenzcatechin," to destroy which is one of the functions of the suprarenal capsules. When these glands become defective, through overwork, this substance accumulates and, being deposited in the skin, gives rise to dinginess of the complexion, brown circles around the eyes, so-called "liver patches" on the face and other parts, brown spots upon the hands, and a deepening of the color of parts of the skin which are normally pigmented, as the axillary regions, groins, and in many patients a line down the center of the back.

This pigmentation is commonly seen in aged persons, in whom, as in others, its cause is the constipation which is usually associated

with old age. The same pigmentation is sometimes seen in young persons, and even in infants, as the result of intense poisoning from intestinal putrefaction. When an anti-toxic diet is adopted, and the bowels are made to act normally, the pigmentation disappears with remarkable quickness.

Eczema

Eczema, one of the most common and most distressing of skin maladies, has long been known by skin specialists to be caused by constipation. Doctor Bulkley, the eminent skin specialist of New York City, has within the last thirty years many times called attention to the fact that eczema is encouraged by the use of flesh food, and that most chronic cases are curable by strict adherence to a non-flesh dietary.

A most distressing form of this disease is eczema of the anal region, one of the frequent results of constipation. This annoying ailment usually disappears very soon when the bowels are made to move three times a day, and meat is excluded from the diet.

Temporary relief from the horrible itching of eczema may be obtained in many cases by bathing the parts with very hot water.

Psoriasis

This form of skin disease, usually more obstinate though less distressing than eczema, is generally incurable without the adoption of a fleshless diet and restoration of the normal function of the colon. In many cases nothing else is needed to effect a permanent cure. A few applications of the actinic rays by means of the arc light or the "mercury light" or the X-ray will generally cause the eruptions to disappear after the flora has been changed.

Itching Skin without Eruption

Many constipated persons, especially old persons, suffer from intense itching and burning of the skin, especially of the back and other parts of the arms and legs. The affection is generally worse in cold weather and when hard water is used for baths. A soap and water bath is generally followed by an increase of the itching. If the skin is

scratched, an eruption resembling eczema appears.

Besides combating the constipation nearly always present, bathe the parts with water as hot as can be borne (120° F.) several times daily. Avoid rubbing. After bathing, apply lanolin cream. The cream should be applied to the whole surface of the body after bathing and daily or even twice a day. If necessary to completely relieve the itching, menthol may be added to the cream in the proportion of ten grains to the ounce.

The following is a most excellent preparation for use in maintaining a healthy condition of the skin and relieving various forms of irritation either with or without skin eruption; the formula was given to the writer by Prof. L. D. Bulkley, of New York, who has employed it for many years in the Skin and Cancer Hospital under his charge.

Lanolin	2 drams
Boroglyceride	1 dram
Cold cream made with	
white vaseline	6 drams

When itching is intense, ten drops of carbolic acid may be added to the above or ten

grains of menthol. When desirable both menthol and carbolic acid may be added.

Vertigo

This unpleasant symptom is a very common result of constipation. Vertigo is a common symptom in cases of arteriosclerosis caused by constipation, and sometimes results from irritation produced by the presence of feces in the rectum. In certain nervous persons, vertigo, faintness or exhaustion are sometimes experienced when the bowels are evacuated by a saline laxative or by an enema. The cause of this is doubtless the absorption of poisons brought into solution by the large amount of fluid present in the intestine. So long as the feces are hard, little absorption can take place. But when they become semi-fluid, the poisons present are brought into solution and are also made to come in contact with the mucous membrane, so that rapid absorption occurs. In some instances, the prostration is such that recovery does not take place for several hours. These are probably cases in which the liver and kidneys are crippled as the result of long-standing disease.

Dr. Case has observed that unpleasant symptoms immediately following an enema are connected with the entrance of the injected liquid into the small intestine through an incompetent ileocecal valve. This is an interesting observation. It suggests that vertigo at other times may be due to refluxed material from the colon, due to antiperistaltic action of the colon. The wretched feeling which many neurasthenics experience in the morning may be due to the same cause. Case has noted that although the small intestine may be entirely empty at night, in the morning several feet of the intestine may be filled with fecal matters which have returned from the colon through an incompetent ileocecal valve.

Disorders of the Urinary and Generative Organs

Urinary troubles in both men and women, as well as in children, are often traceable to constipation. Very foul-smelling urine often owes its unnatural odor to the presence of putrefaction poisons absorbed from the intestine.

Both inability to urinate and a frequent desire to urinate may result from the accumulation of feces in the rectum. In children the escape of urine during sleep is often due to constipation.

Prolapse and retroversion of the uterus is a common result of the straining necessitated by constipation in women and girls.

Dysmenorrhoea, leucorrhoea, and a varicose condition of the broad ligaments, which is accompanied by much pain and discomfort, may result from the pressure of feces in the rectum and lower colon. Nocturnal seminal losses and an abnormal irritability of the parts, causing erection and also neuralgic pains in the testicles, and varicose veins, may result from the congestion caused by the pressure of feces in the rectum and lower colon.

In all these disorders first attention must be given to removal of the exciting or predisposing cause by changing the intestinal flora and training the bowels to move three times a day. In many cases an enema of three or four pints of water may be used with advantage at bedtime to make sure that the

colon is thoroughly emptied at least every twenty-four hours.

Fecal Fever

Accumulation of feces in the colon is a frequent cause of attacks of fever which so much resemble malarial paroxysms that they are usually treated by the administration of quinine. There is often a distinct chill, followed by fever and sweating. The tongue is coated, the breath bad, and there is much headache, and sometimes vomiting. The fever may last several days, but disappears quickly when the bowels have been thoroughly evacuated.

These attacks are very common in persons who are subject to colitis, and much mucus is often discharged when the bowels are cleared out.

Neglect to secure complete and regular evacuation of the bowels is a frequent cause of rise of temperature after confinement and in convalescence from acute illness. Accumulation of feces not infrequently occurs when the bowels move daily and even when the bowels are quite loose, as shown by the

immense quantities of loathsome material which may be washed out by means of a thorough enema. The writer recalls a case in which a woman who had very loose movements for two or three weeks was found to have an enormous mass of hardened fecal matter in the rectum, and a very great accumulation of feces in the lower colon.

Bed patients should always be made to sit up when moving the bowels or urinating, when this is at all possible, so as to secure complete evacuation of the urine and feces. In most cases this may be done without injury after the second day. The same remark applies with special interest to cases of confinement. There is so often an accumulation of feces in the colon in pregnancy, especially within the last two or three weeks before confinement, that it is highly important to give the matter prompt attention at once after the child is born, as well as before confinement. Very often a great quantity of putrefying material will be removed, the retention of which may give rise to autointoxication with fever and even worse symptoms. In all cases of this sort change of the intestinal flora

and the establishment of a normal intestinal rhythm should receive first attention.

Flatulency

This symptom may result either from the excessive formation of gas in the intestine, or from the accumulation of gas. A certain amount of gas is natural. The presence of gas in the intestine is an aid to peristalsis. This is especially true of the large intestine.

Excessive formation of gas occurs through the action of bacteria upon the foodstuffs. Gas is most readily formed from cooked starch or sugar, but may be formed from cellulose and from protein. Odorless gas is usually formed from starch or sugar, inflammable gas from cellulose, and gas having a foul odor from protein. These different elements of the food are acted upon by different species of bacteria, so that the character of the gas formed in the intestine becomes something of an index to the sort of bacteria present. Bacteria which act upon starch, sugar and cellulose are comparatively harmless, while the presence of foul-smelling gases indicates the presence of putrefaction and the

pernicious bacteria and virulent poisons which are always present in this condition.

The formation of gas in excess is due primarily not so much to the excessive use of starchy food, as many persons suppose, but to stasis or stagnation of the food. Bouchard showed long ago that if the foodstuffs remain in one part of the alimentary canal, even in the stomach, fermentation and other bacterial changes take place.

An important remedy for flatulence, then, is increased intestinal activity. When the gas is confined to the colon an enema, either warm or cool, will usually secure relief; for permanent relief the causes of the constipation must be removed by systematic treatment.

Flatulence which is not relieved by emptying the colon is due to incompetency of the ileocecal valve. The absence of the check valve at the junction of the small intestine with the colon permits the gas to pass back into the small intestine. This condition is generally greatly mitigated by increased activity of the bowels; a radical cure may be accomplished by repairs of the ileocecal valve.

Flatulence may become dangerous in cases of high blood pressure with degeneration of the blood vessels. The great accumulation of gas in the intestines forces the blood out of the abdominal vessels into the general circulation, and so raises the blood pressure. If the blood pressure is already high, and the blood vessels are much diseased, the rise of pressure may be sufficient to cause a rupture and apoplexy with paralysis, if the rupture occurs in the brain.

The wet girdle or moist abdominal bandage is often found a most efficient means of combating flatulence. The bandage must be kept moist, and should not be too warmly covered. The mackintosh cover must be omitted, the purpose being to promote evaporation and thus maintain a mild stimulant action upon the intestine. The bandage will dry out in three or four hours, when it should be renewed. It may be worn with advantage both night and day. The bandage must be changed or boiled daily to avoid producing skin infection.

Flatulence in the colon always means stasis, that is, delayed feces which need removal.

Persons who have been accustomed to a hearty meat diet sometimes suffer considerably from flatulence when a change is made from meat to vegetables, but this should not be considered as a need to return to a highly nitrogenous diet. After a short time the activity of the bowels will be increased to such a degree that the constipation will be overcome, and the flatulence will disappear. In cases in which the free use of cereals or starchy food is accompanied by acidity of the stomach or heartburn soon after eating, the difficulty may be relieved by increasing the amount of fat taken with the meals. Usually one or two tablespoonfuls of olive oil taken at the beginning of the meal will cause the disappearance of this unpleasant symptom.

Flatulence is an evidence of the presence of pernicious bacteria, that is, a bad intestinal flora. Welch's bacillus, the so-called gas bacillus, is the great gas producer. This is the organism that produces the fatal gas gangrene which is so much dreaded in military hospitals.

When lacto-dextrin or acidophilus buttermilk is given to change the intestinal flora,

not infrequently there is an enormous increase in gas production. This indicates that the remedy has reached the colon and that the change of intestinal flora has begun. By a persevering use of large doses of lacto-dextrin or the free use of acidophilus buttermilk, the pernicious organisms may be driven out and within three or four days the amount of gas will diminish; and when the flora is changed the gas will disappear altogether. This demonstrates that carbohydrates are not the real cause of flatulence; the right carbohydrates are, in fact, the one efficient means of curing this condition.

The observations of Grützner, Boaz and others have shown that a coated tongue and foul breath are at least, in part, attributable to the same bacteria which are present in the colon in cases of chronic autointoxication. It has been definitely proven that the bacteria of the colon may ascend to the stomach and the mouth. It is evident, then, that the one important thing to be done in these cases is to increase the activity of the colon and to change the intestinal flora. By the use of these measures the tongue can be made clean

and kept clean. The writer has demonstrated this in many hundreds of cases.

Foul Tongue and Bad Breath

These common conditions are more often due to constipation than to neglect of the mouth. A high protein diet, that is, the free use of eggs and meats, together with constipation even in very mild degree, will cause coating of the tongue and a fecal odor of the breath. The general low resistance caused by chronic toxemia destroys the ability of the saliva to prevent the growth of germs in the mouth and the result is coating of the tongue, ulceration of the gums and decay of the teeth.

The cure is not to be found in dentifrices, lotions, tooth brushes or dental procedures, "mouth treatment," etc., but in removal of the cause by training the bowels through diet and other measures, to move thoroughly three times daily. Of course the toilet of the mouth and "mouth treatment" by a skillful dental surgeon must not be neglected.

A diet consisting exclusively of wheat bran and fruit, preferably apples and oranges, continued for three or four days, will rapidly

clear the tongue and sweeten the breath in ordinary cases. An ounce or two of cooked bran should be eaten daily and apples may be eaten in any quantity which does not cause inconvenience. Twelve to sixteen apples taken at four meals will usually be found sufficient. The fruit must be eaten raw and should be well chewed. One or two apples or other fruit may be eaten whenever a craving for food is felt. Fruit imposes little or no labor upon the digestive organs. Berries, grapes, peaches, oranges, melons, tomatoes, lettuce, cucumbers and celery may be added to the bill of fare if desired. The greater the bulk and the less the actual food value represented in the food, the better.

The addition of bran is necessary for the reason that the tender cellulose of fruit is often almost completely digested and so furnishes little residue.

The "milk regimen" conducted according to the author's method (see Index), for one to two weeks rarely fails to clear the tongue and to remove the foul odor of the breath.

Anal Infections

Hemorrhoids, fissures and fistulas arising from abscesses about the anus, are due to infection. The best preventive is thorough cleanliness. The anal region should be carefully cleansed with water after each bowel movement. It is best to cleanse the parts while the anus is still relaxed, so that the anal canal as well as the margin of skin about the anus may be well cleansed. When fecal matter is left behind in the folds of the skin or mucous membrane, infection readily occurs, the results of which may be hemorrhoids, ulcer, fissure, or an abscess which may result in a "blind" fistula or a complete fecal fistula.

A Hindoo regards it as a religious duty to cleanse himself with water after every bowel movement. A missionary told the writer that he was once interrupted while holding service in a Bengali village by a native who rose up and shouted, "This man isn't fit to preach. He wipes off with paper." The entire audience fled as though from a leper. We have much pity for the degraded heathen but may learn not a few lessons in self-respect and

personal cleanliness from these benighted children of Nature.

Hemorrhoids

The pain and inconvenience from hemorrhoids is usually the result of infection. The distended veins do little harm unless inflamed. The infection results from the retention of fecal matter in the folds of the mucous membrane. Straining at stool distends the veins and cracks the mucous membrane, thus opening up channels for infection. Abrasions are also often produced by rough toilet paper and by lack of care in the insertion of the enema tube. Thorough cleansing of the parts with water after bowel movement is an excellent preventive measure. This is the universal custom in India and is certainly more sanitary, if less convenient, than the method in universal use in western countries. The use of an antiseptic suppository after each bowel movement is a most useful precaution.

Instead of a suppository, carbolated vaseline may be used with equally good results. When the hemorrhoids become inflamed, dry calomel or a mixture consisting of equal parts

of calomel and starch should be applied after each bowel movement. Persons who are suffering from hemorrhoids should apply carbolated vaseline regularly every time the bowels move. In most ordinary cases operations may be avoided by the use of these simple measures. The flora must be changed and kept changed by methods elsewhere indicated (see Index).

When the bowels move freely three or four times a day, hemorrhoids are rarely troublesome, at least when the precautions above recommended are employed. In many cases they apparently disappear. When persistent, however, they should be removed. This may be done with perfect safety and with so little inconvenience that no one who suffers from hemorrhoids should hesitate to have them removed. Chronic irritation is an invitation to cancer.

Anal Fissure or Ulcer

This painful affection most generally follows hemorrhoids. If it does not speedily disappear when the bowels become regular, resort to operation is necessary. Operation

is also indicated when the ulcer renders defecation painful and thus interferes with regular bowel action, which is most generally the case.

A cure may be accomplished in many cases by the use of the measures suggested for hemorrhoids. The flora must be changed and kept changed.

Anal Fistula

Anal fistula is the result of an abscess developed in the tissues outside of the anal canal, the result of penetration of pus-forming bacteria. If the abscess opens both into the bowel internally and through the skin externally, a fistula is formed through which fecal matters may escape. Cases of this sort require the services of a surgeon. The operation is not a serious one and may be done under local anesthesia. Change of flora is highly important in these cases. The bowels should move three or four times a day and carbolated vaseline or calomel should be applied after each bowel movement to promote healing and to prevent recurrence of the difficulty. Used in the manner directed, calo-

mel is entirely harmless, not being absorbed. It simply acts as an antiseptic, suppressing the development of harmful bacteria.

Anal Itching

This is usually a form of eczema which is kept up by an irritating discharge from the rectum. The measures recommended for eczema will effect a speedy cure after the bowels have been regulated and the rectal irritation or proctitis has been cured. The X-ray or the actinic ray will easily complete the cure when the flora has been changed. The most severe itching may be temporarily relieved by applications of water at a temperature of 120° F. At this temperature, the duration of the application must be very short, a mere touch, repeated at intervals of one or two seconds until the itching is relieved. The relief usually lasts for several hours.

Rectal Prolapse

In cases of prolapse of the rectum frequent movements of the bowels are necessarily avoided on account of the inconvenience involved. These cases may be cured by a simple

and safe surgical procedure. Such an operation should be the first step in the effort to cure the chronic constipation present. After the operation, the free use of bran and paraffin at each meal will prove efficient.

Anal Incontinence

Persons whose anal sphincters have been paralyzed by disease or by careless surgery often keep the bowels constipated to avoid annoyance from incontinence. In such cases it is of course necessary first of all to remedy the anal defect. This may usually be done by a skillful surgeon and the operation is attended by no serious risk.

Anal Spasm

Undue contraction of the anal sphincter is generally associated with fissure, hemorrhoids or rectal irritation. If not speedily relieved by removal of the source of irritation, an operation for stretching the sphincter may be necessary. Excessive tension of the sphincter appears to be sometimes present without evidence of local irritation.

The application of heat is a most efficient

means of relieving anal spasm. Heat may be applied by means of a fomentation or by sitting in very hot water.

Abdominal Tenderness

Very hot fomentations applied two or three times a day for ten or fifteen minutes are almost a sovereign remedy for the abdominal tenderness usually found in chronically constipated persons, especially when colitis is present. The moist abdominal bandage used at night with a mackintosh cover is a very old-fashioned and still unrivalled remedy for tenderness, soreness and ill-defined pain in the abdomen. These remedies are more than merely palliative, but of course are not in themselves curative unless the constipation which gives rise to the congestion to which the pain is due, is also cured. It is of course necessary to change the intestinal flora. This is of first importance for the reason that by far the majority of abdominal pains, tenderness and other miseries, with accompanying back-aches and "dragging" sensations, are due to colitis.

Colic Pains

Apply very hot fomentations to the abdomen and administer a hot enema. Repeat the applications both of the fomentations and of the hot enema until the pain ceases, as it soon will do. Heat is a most excellent antidote for pain. It also relaxes muscular spasm; it is thus a most appropriate remedy for intestinal colic. In all cases of colic the hot enema should be administered for the purpose of relaxing the bowel and removing the fermenting food residues which give rise to the gas and hence are the real cause of the colic. The flora should be changed to suppress the gas-forming germs.

“Kinks”

So much is being said about “kinks” in current medical literature, it is not remarkable that the laity should begin to take an interest in the subject. The writer’s chief purpose in mentioning this subject here is to emphasize the fact that “kinks” are of far less consequence than it was at first supposed. X-ray evidence has demonstrated that kinks and

fold in the colon are seriously obstructive only in very rare cases. To advise a surgical operation simply because the X-ray shows a "kink" or fold in the transverse colon or a very pronounced prolapse is most improper. It has been proved that the so-called "Lane's kink" of the terminal ileum is seldom a source of trouble and very rarely requires surgical interference. By the adoption of an atoxic diet from which all flesh meats are excluded and by the employment of the necessary measures for securing three bowel movements daily, the troubles supposed to arise from "kinks" rarely fail to disappear; and without the adoption of these measures surgery affords only temporary relief, sometimes not even that, as a return for the very great risk to life and the severe suffering and shock involved in such operations as "short circuiting" and removal of the colon.

In all cases of this sort change of flora is the most important measure that can be employed. This means should be applied in every case before operation is considered. Operation is justifiable only in cases in which relief cannot be obtained by changing the

intestinal flora and suppressing putrefactions and the autointoxication which arises therefrom. This statement is not made on theoretical grounds but after observing and testing both methods in many hundreds of cases. It is not too much to say that by an efficient application of the reliable methods for changing the intestinal flora which are now available, surgery for relief of crippled conditions of the colon may be very largely, if not altogether, eliminated. Only in very exceptional cases are surgical measures necessary, when the flora is changed and the change maintained. Certainly, operations for kinks, either "Lane's kink" or any other so-called kinks, or Jackson's membrane, prolapse of the colon, dilatation of the cecum and like conditions, and especially removal of the colon and the short circuiting operation, are no longer justifiable. These operations are needed only in cases of malignant disease of the colon and cases in which mechanical obstruction exists to such a degree that the colon cannot be made to functionate properly even by the aid of the measures which have been outlined in the foregoing pages.

BOWEL HABITS OF UNCIVILIZED MAN

Civilized human beings have departed so far from natural primitive modes of life, and have adopted so many unphysiologic practices, that it is quite impossible from the conventional usages of civilized people, to form any just conclusion of what are natural or biologic modes of life for human beings. This is particularly true of customs and habits in relation to human alimentation. From a study of the modern hotel bill of fare, one could not possibly obtain even a suggestion of man's primitive and biologic diet. The natural conclusion would be that man is a universal feeder, since the average hotel menu presents practically everything that any animal eats; but biology teaches us that man is naturally frugivorous, and science offers no reason why he should have departed from his original bill of fare, to which his nearest relatives, the anthropoid apes, the chimpanzee, the orang-utan and the gorilla, living in their native forests, still scrupulously adhere.

Man has not only developed wrong habits in relation to the kind of food he eats, but has become unbiologic in almost every phase of his daily life. Constipation is simply one of the natural consequences of these perversions. It is scarcely too much to say that the average civilized man is the victim of chronic constipation. If his bowels move once a day, or even once in two days, he feels that his condition is very satisfactory; whereas Cannon, in his work entitled "The Mechanical Factors of Digestion," has shown that practically all the digestible food taken at an ordinary meal is digested and absorbed within eight or nine hours from the time it is eaten, and the unusable residue is at the end of this period found deposited in the colon, ready for ejection. Since the chief business of the colon is to eject wastes from the body, why should the performance of its function be so long delayed? The colon contents are largely made up of bacteria and excretory products, the undigestible elements of the food constituting only about one-half its bulk, while starch, fats, and protein are found in only very small and negligible quantities. It

should be remembered that bowel movement is not simply for the purpose of discharging the unusable residues of food. An equally essential reason for bowel movement is the discharge of the bile and other highly poisonous excretions which are discharged into the colon from the blood. No possible good, but only much harm can come, then, from the prolonged retention of these body wastes and unusable residues. There is, in fact, no physiologic reason why food residues should be retained in the body more than twelve to eighteen hours, or at longest twenty-four. It is evident, then, that bowel movements should occur at frequent intervals, for the purpose of removing these waste and poisonous materials.

The natural intestinal rhythm, as has been previously explained, provides for an unloading of wastes by a bowel movement after each meal and sometimes an additional one on rising. This requires three or four bowel movements daily. Although convinced by careful and extended observations in dealing with many thousands of invalids, that the bowels should be made to move several times

a day, the writer several years ago set about collecting from original sources facts concerning the habits of uncivilized tribes of human beings.

The keeper of the London Zoological Gardens informed the writer that the chimpanzee, orang, and the other large apes move their bowels four times daily with perfect regularity. Professor Hornaday, superintendent of the Bronx Park informs us that the large apes in the great collection under his supervision move their bowels three times a day.

Extensive inquiries made by means of questionnaires sent out to physicians practising among primitive people in various parts of the world, show that the custom among many of those who live in a really primitive state, and have been little influenced by contact with civilization, is the same as that of the higher apes. Replies were received from one hundred and forty physicians who have had abundant opportunity to become acquainted with the habits and usages of the wild or half-civilized people with whom they have been closely associated, and among

whom they have practised for years. A summary of these replies will be found highly interesting, especially in the light of the physiological facts which have been presented in the previous pages. It is most instructive to find wild and primitive people in widely separated portions of the globe following identical usages to which they have been trained by Nature, the universal teacher. A common instinct has led to a practical uniformity of habits among wild tribes who have not yet been sophisticated and perverted by contact with civilization. It is interesting also to note the same identity between wild tribes and those most remarkable creatures of the tropical wilds, the anthropoids, in practices connected with eating and bowel action. For much valuable and interesting information, a small portion of which is summarized in this chapter, I am indebted to scores of missionary physicians who have devoted their labors to the noble work of civilizing and Christianizing the people of heathen lands.

From this original and authentic information the fact appears that among tribes which have been uninfluenced by the customs of

civilization, who still adhere to primitive habits in diet, and who live a free and active life in the wild, the bowels move two or three times daily. A single daily movement is regarded by such people as constipation, and gives rise to alarm. The one-movement-a-day habit appears only among those classes or castes who live a sedentary life and have adopted unnatural habits in diet, such as the use of hot condiments, concentrated food, etc. The aristocratic classes of India and China afford striking examples of this, suffering much from constipation in consequence of their idle and luxurious habits, and from the use of curries and other unwholesome condiments, while the working classes, whose diet and habits are more nearly normal, are generally exempt.

As regards the frequency of bowel movements, physicians located in the following countries reported the usual custom to be two or more daily, usually two, for the very good reason that two meals only are eaten, the first movement being on rising or after the first meal, and the second soon after the second meal, or before retiring:

Rhodesia, Uganda Protectorate, Nyassaland, Nigeria, Harda (India), Delhi (India), Punjab (India), Kashmir, Nagpur (India), Bawda (India), Persia,—three or four times in summer when fruits are plentiful. Aintab (Turkey), Harpoot (Turkey), West Coast of Africa,—two or three. Portuguese Congo,—two or three. Egypt,—children four or five. Japan, Arabia,—two or three.

It is interesting to note that the experience of the millions of primitive and half-civilized people who inhabit the above named countries demonstrates perfectly that an intake of food should be soon followed by an output of food residues and wastes.

In all these countries, as among practically all primitive people, great attention is given to the bowels. The mothers carefully train their children to move their bowels at regular times, and much pains are taken to make the diet such as to promote intestinal activity. The virtues of fruits and green vegetables are fully appreciated, and where rice is the principal food, as in most of the Orient, large use is made of green vegetables.

It is especially of interest to note the fre-

quency with which some useful feature of bowel hygiene is found in vogue among primitive people who have practised it from time immemorial, while among civilized people the same practice has only recently become known as one of the discoveries of modern medical science. It is becoming more and more evident that our modern civilization in emerging from barbarism has left behind much that was not only useful but essential to a healthy physical life, and we may therefore profit by a careful study of the habits of primitive people and even of those wild animal species which belong with man in the class of primates, and are closely allied to the human species in structure and function.

Here are a few extracts from the replies to our questionnaire, which will be found most instructive as well as interesting:

“I am of the opinion that diet has a great influence. The Labances eat plenty of figs, either alone or mixed with juice of grapes or juice of carob beans, brown bread, fruits, vegetables, olive oil, olives, etc., and drink plenty of spring water at meal times.”—A. J. Manasseh, M.D., Bruana, Beyrout, Syria.

“Laxative foods used are the following: Cooked manioc leaves, bananas, pineapples, bingondia (a sour-sweet seedy fruit), plantains, peanuts, palm oil, pumpkin seeds mashed and cooked. Raw guava leaves are used for diarrhea, also the clay mounds built by white ants.”—Mattie and P. Frederickson, Belgian Congo, West Central Africa.

It is interesting to note that the most primitive tribes of savages have recognized the importance of regular and frequent bowel action and provided for the maintenance of this important function by including in their dietary special laxative foods such as named above. This usage is practically universal among wild tribes in all parts of the world.

“In the Cape Colony the staple food is stamped maize and sour milk; the absence of the sour milk leads to constipation. In the Northern Transvaal the staple food is thick maize porridge, sour milk, and, in summer, green vegetables. People go more often (*i. e.*, say three times a day) when taking both vegetables and milk. When these are scarce, they may go only once.”—Neil Macvicar, M.D., Lorendall, South Africa.

It is especially interesting to note that the Cape Colony natives have by experience learned to appreciate the value of sour milk as a laxative food and corrective of intestinal disorders. Several African travelers have called attention to the fact that among the native tribes of Africa milk is generally used in its soured state. The custom is to put the milk into a gourd at night which is reserved for this particular purpose. In the morning the milk is soured and ready for use. At night a new supply of milk is put into the empty gourd which is never washed and so preserves the lactic-acid-forming ferment in an active state.

“The natives are, in Tora, almost entirely vegetarians, living on millet or plantains or beans. They rarely get meat. In 9642 out-patients seen during the last seven months of 1911, there were 174 cases of constipation, one and eight-tenths per cent of the whole.”—J. Howard Cook, M.D., Uganda Protectorate, East Africa.

In this country the percentage of patients in whom constipation is present is just the reverse of that in Uganda. Whereas, in Uganda,

there are less than two per cent who are constipated, in civilized countries among sick people, there is scarcely one in a hundred who is not constipated.

"The rather coarse diet, largely grains and vegetables, has a favorable influence on the bowel movements. The stools are usually very large and fairly soft."—A. H. Norton, M. D., Haiju, Korea.

"The people eat large quantities of rice, turnips, peppers, roots, vegetables and little meat. The large quantity of residue must act as a stimulus to peristalsis."—W. C. Purviance, M. D., Chung Ju, Korea.

"Cereals, as wheat, barley, oats, millet seed, and all kinds of vegetables, are the staple food here (extreme north of Korea); very little fish and less meat is eaten."—F. H. Birdmann, M. D., Dotson, Korea.

The natives of Korea, like those of China and Japan, are generally known as rice eaters. It is interesting to note that the natives of Korea make large use of turnips and vegetables and little use of meat. Flesh foods are unquestionably constipating in their nature, not only because they are completely digest-

ible, leaving little residue behind, but because the putrefaction to which they give rise results in the formation of ammonia and other alkaline substances which paralyze the bowel. "Meat bacteria," which swarm in all kinds of flesh foods, are also a prolific cause of colitis, which by causing spastic contraction of the descending colon and the pelvic colon, produces mechanical obstruction to bowel movement, and, also, as shown by Dr. J. T. Case, induces powerful retro-peristaltic contractions by which the intestinal contents are forced back into the right half of the colon. The cecum and ascending colon become greatly dilated as a result, and in time the cecum becomes movable and prolapsed. The stretching of the colon enlarges the ileocolic junction until the ileocecal valve becomes incompetent, thus establishing the condition known as intestinal toxemia with its long train of evil consequences. The vegetarian habits of the people of Korea are without doubt of great service to them in enabling them to successfully combat the highly unsanitary conditions under which they live.

"Bowel movement full and frequent among

the working people, who eat large quantities of vegetables; more disturbed among the better classes, who eat more meat."—J. K. Cox, M.D., West China.

"My experience with patients has been that they are not so subject to constipation as persons in the U. S. whom I have treated. Think probably the free use of greens and other vegetables has something to do with the difference, as well as not postponing the call of Nature, as is done by civilized persons."—Ida M. Scott, M.D., Tak Hink Chan, South China.

"The vast majority of the people live on coarse grains and coarse vegetables, which are favorable to large bowel movements."—Geo. D. Lowry, M.D., Peking, China.

"In my own case, going onto a purely local diet of rice and coarse vegetables is usually accompanied with looser motions."—George Hadden, M.D., Yung-an Fookin Pwo., China.

"Rice is the principal diet, but is usually accompanied by considerable quantities of vegetables, largely what we call greens. The Chinese have a great variety of leaves and

stocks that are used for greens, such as cabbage, lettuce, and many other kinds that we do not see in America. With this diet and exercise, the healthy Chinaman usually has free bowel action. I think the 'greens' is a very suitable diet for this climate."—Jean McBurney, M.D., Cheung Chow, Hong Kong, China.

Greens are an equally "suitable diet" for the United States. As McCollum and other investigators have so often found, greens are an essential part of a complete bill of fare.

"Foods coarse, and largely vegetable, especially among the country people, which means four-fifths of the population. Chinese are not meat eaters to a great extent."—F. F. Tucker, M.D., Pangkiachwang, Shantung, China.

"The natives eat much vegetables, which regulate the bowels."—Cecil I. Davenport, M.D., Shanghai, China.

The people of China as well as those of Korea are evidently protected from the natural constipating tendency of a rice diet by the free use of coarse vegetables. The large use of vegetables of all sorts which is prac-

tised in the Orient is generally forgotten by those who call attention to the fact that rice is the staple foodstuff in this part of the world. It is true that rice is the chief source of nutriment but at the same time Nature has taught these people to make ample provision for the bulk which is essential to stimulate normal peristalsis by the use of greens and vegetables of all sorts. Vegetables are used not only during the summer months but at other seasons also. Turnips and several other roots are preserved by pickling in salt brine as cucumbers are preserved in this country. A very large use is also made of bamboo sprouts, of the leaves and roots of certain lilies which are preserved by drying and of several varieties of seaweed, from some of which a gelatinous substance known as Japanese isinglass or agar-agar is made, while others are used in their native state, as Iceland moss and Irish moss are used in this country.

“The natives note that in eating pumpkins and prunes they have more bowel movements. An old man told me that if a person, early in the morning before taking any food,

eats ten fresh prunes from the tree, he'll have bowel movements easily."—G. Yeram, M. D., Gumaldjine, Turkey.

The most primitive people have learned by observation the importance of bulk, a lesson which has yet to be learned by the great majority of people in civilized lands. Knowledge of the laxative value of fruits, especially of prunes is, however, quite widely diffused. The Turkish peasant who told our friend Dr. Yeram that ten fresh prunes taken "from the tree" would produce a laxative effect was perhaps not aware that dried prunes may be so freshened by soaking in cold water for 24 hours that their laxative quality is to a large extent restored. The free use of raw soaked prunes is a highly valuable food remedy for constipation which has long been in use by many European and American physicians.

"The principal food of both city and rural population of the region is boolghoor (cracked wheat which has been cooked, dried, and the thin outer skin removed before cracking. It is cooked in many ways. The commonest is to boil it about ten minutes, and add a little

melted butter before serving), and coarse bread of wheat or barley, varied by lentils and other legumes, and the fermented milk of the country (yougurt in Turkish, leven in Arabic, or matzoon in Armenian). The village people eat considerable fruit, especially grapes in season, but very little meat or vegetables. The city dwellers eat a good deal of meat and vegetables, more fruit, and less yougurt than the villagers. They also eat finer bread and more spices and condiments. In general, I may say that constipation is relatively much less common than in America, and much less common among the villagers than in the city people; in fact, very seldom seen in those who eat boolghoor. The posture assumed in defecation may also have something to do with it. They never sit on a stool, but always use the natural, squatting posture. In the city, where they have regular privies, the arrangement is a slit or opening in the floor, over which the person squats. The universal habit is to move the bowels three times a day."—F. D. Shepard, M.D., Aintab, Turkey.

The above interesting account of the die-

tetic habits of the people of Turkey kindly sent us by the late Dr. Shepard contains enough practical hints about dietetic methods of combating constipation to enable almost any practical person to formulate for himself an efficient and laxative dietary. It is evident that however much we may be in advance of the ignorant Turkish peasant in the various forms of culture which together make up what we call civilization, we may study his methods in diet with great profit.

The matter of the position in sitting at stool to which Dr. Shepard also called attention is one of no small importance. We are learning more and more the importance of making a careful note of the hints which Nature gives us in the instinctive leadings of animals and human beings living in a wild or primitive state which have resulted in the formation of customs and habits the essential relation of which to our physical welfare has been heretofore too much disregarded.

In all parts of Turkey, it is the custom of the people to move the bowels three times a day, which is the natural result of the use from early childhood of the several laxative

foods above mentioned. Of this we are assured by a personal statement made to the writer by the late Dr. Shepard, who was most intimately acquainted with the habits of the Turkish people through living and practising among them for more than thirty years. That the custom of tri-daily bowel movement is common to all classes is shown by an incident related to the writer by the eminent Sir Arbuthnot Lane, of London, England. The famous surgeon was one day consulted by an official from the Turkish Embassy in London who desired relief from constipation. When asked for a particular account of his symptoms he admitted that his bowels moved once a day but declared that he was greatly constipated and not half a man, and that when his bowels moved three times a day his vitality and stamina were more than doubled.

“Yougurt is the form in which milk is taken in Persia. We rarely see appendicitis in the natives. I often wonder whether the yougurt may be the preventive. The common people live on yougurt, cheese, bread, and fruit. Meat only occasionally. They all consider milk (not yougurt) a laxative.”—W. S. Vannemann, M.D., Labriz, Persia.

It is certainly very interesting to note that the custom of using sour milk should be nearly universal among the hundreds of different tribes and nations filling the vast territory from the southern tip of the dark continent to Persia. It is also interesting to observe a verification of the observations made some years ago by Dr. Senn, who studied the people of the east coast of Africa and noted the absence of appendicitis, an observation also confirmed by Dr. Lucas-Champonnière, of France, who found appendicitis very rare among the wheat- and date-eating Arabs of Algiers, and among the inmates of prisons and insane asylums in France, where meat is rarely made a part of the bill of fare.

"The diet seems to favor looseness, since it consists largely of coarse bread from unbolted flour; also in summer of large quantities of fruit ingested."—J. A. Funk, M.D., Hamadan, Persia.

The use of superfine white flour appears to be almost wholly confined to civilized nations and there can be no doubt that to this practice is largely chargeable the almost universal prevalence of constipation in countries which

claim to be the most advanced in civilization.

"It is a common saying among them that milk acts as a laxative, especially if freshly milked and unboiled."—P. W. Brigstocke, M. D., Jerusalem, Palestine.

The fact that boiled milk is constipating has long been recognized in this and other civilized countries. It appears that the same fact is known to the uneducated natives of Syria. It is only recently that science has offered the explanation which has been supplied by the bacteriological laboratory, that boiled milk undergoes putrefaction in the intestine because of the destruction of the acid-forming bacteria which abound in raw milk which has been exposed to the air, and stimulate bowel action and prevent putrefaction.

"The diet is largely a vegetable and cereal one, meat being eaten only occasionally."—A. F. Grant, M.D., Assiut, Egypt.

It is instructive to note that the Egyptians are still, as in ancient times, practically non-flesh eaters. The experience of two or three thousand years has not convinced these simple tillers of the soil that the natural products of the earth are not capable of affording ample

and sufficient nourishment. The fertile valley of the Nile in centuries far remote from the present supported a population perhaps more dense than has been maintained in any other part of the world. It may be that some future time will again see this highly favored region teeming with human life and enterprise, supported as of old by the products of its marvelously fertile soil.

“The coarse, simple diet—millet or corn porridge or bread, cabbage, soup, etc.—of the country seems to favor regularity of the bowels.”—Mrs. Estella A. Perkins, M.D., Pao Ting, China.

“The almost exclusive vegetable diet—rice, cabbage, etc.,—seems on the whole to be favorable, and constipation is not so common among the sedentary classes as might be expected.”—B. S. Browne, M.D., Ningpo, China.

“Constipation is not common, but the inhabitants of Manchuria are mostly vegetarians. *i. e.*, eat little butcher meat except on festive occasions.”—Drs. Christie and Muir, Mukden.

“People suffering from diarrhea fre-

quently take rice and "dahi" (curds, sour milk), to check it. Ordinary milk they generally consider constipating."—N. C. Henderson, M.D., India.

"People eat wheat, Indian corn, and millet seed breads. The first named is supposed to be constipating, and the last two laxative."—W. L. Pennell, M.D., Bannu, India.

"The coarse wheat and barley flour used for their bread is, without doubt, favorable to regularity."—Edna B. Kuslar, M.D., Phalera, India.

Wheat meal, as well as rice, is very largely used in India. England annually obtains enormous quantities of wheat from her Indian provinces the price of which is such that the Hindu peasant finds it necessary to make rice his staple, although considerable quantities of wheat bread are used by the wealthier classes. It is interesting to note, however, that the wheat thus used by the natives is chiefly employed in the state of coarse meal, rather than the fine bolted flour from which two most important elements, cellulose and vitamins, have been removed by the milling process.

“Usual diet of rice with green vegetables, lentils or occasionally meat, favors regular motions. Boiled radishes favor diarrhea, and fish favors constipation.”—Dr. Minnie Gomery, Idlamabad, Kashmir.

“Diet, rice and vegetables, rarely meat. Rice is eaten in great excess. People pass large stools, as a lot of rice is ejected. Presumably nitrogen and salts are used up and starch excreted.”—H. E. Rawlence, M.D., Srueagai, Kashmir, India.

Even remote Kashmir, which has been so little in touch with modern civilization, appears to be really up to date in matters dietetic. Meat is only used occasionally, whereas green vegetables and lentils combined with rice constitute the regular dietary.

The passing of quantities of undigested rice is doubtless due to the fact that the rice is imperfectly cooked, a custom very common in rice-eating countries, and perhaps a wholesome one. The Scotch highlander eats his oatmeal less than half cooked and is wonderfully sturdy. Some undigested starch in the feces prevents putrefaction.

“The diet being chiefly vegetarian (among

the Hindus it is so entirely), the large amount of vegetables taken seems to act as the necessary stimulus to the bowel."—Robert Madison, M.D., Rajshalu, India.

"Diet of the people mostly fruit and vegetable. Have found that when fruit and salad oil could be added, tongues are clean, moist and red. Where the white bread is taken in imitation of the foreigner, troubles begin similar to those at home. The national custom is to eat but two meals a day."—Belle J. Allen, M.D., Baroda Camp, India.

The observation made by Dr. Allen, that the natives of India begin to suffer from constipation when they adopt the use of white bread, though previously free from this curse of civilization, is highly instructive. It is interesting to note that the U. S. Department of Agriculture is making a strong effort to bring to the notice of the American people the importance of using the whole grain instead of discarding the outer portion, or bran, which is now known to contain by far the largest share of the lime essential for perfect nutrition as well as the highly essential vitamins. It is also interesting to note that, although the

natives of India as well as of most other countries of the globe eat but two meals a day, the prevailing bowel habit among these people is two or three movements daily. More frequent meals should give rise to more frequent movements and would doubtless produce this effect in this and most civilized countries were it not for the highly concentrated and highly constipating character of the diet.

“Motions are large, bulky and not formed, but pultaceous. People of these parts eat largely of ground wheat and vegetables, not much meat. Hindus seldom eat flesh.”—A. H. Browne, M.D., Amristsar, India.

“Meat tends to constipate; vegetables and milk tend to loosen.”—M. M. Brown, M.D., Sargodha, Punjab, India.

Dr. Brown, as well as other close observers of the relation of diet to health among people of simple habits, notes the effects of a meat diet in producing constipation. The reason for this, as indicated elsewhere, is that a meat diet produces colitis and intestinal putrefaction.

“People coming from the interior are much more regular than those living in Smyrna,

where more meat is eaten than in the interior. After some time in Smyrna, such people tend to become less regular.”—D. McKenzie Newton, M. D., Smyrna.

“The use of peanuts in all forms, and the eating of cooked green leaves of several kinds, used daily, keeps their bowels in good shape.”—A. Sims Roma, M.D., Ferrovia, Italy.

“On the ordinary native diet there is scarcely ever any constipation. On other diet, occasionally.”—E. MacKenzie, M.D., Hog Harbor, Santo, New Hebrides.

Rare Occurrence of Cancer and Appendicitis Among Primitive Tribes

It is the universal testimony that cancer and appendicitis are extremely rare. Doctor Shepard, of Aintab, Turkey, who had an enormous practice among the Turks for more than a quarter century, and was recognized as perhaps the leading abdominal surgeon of the Orient, wrote to the author;—

“There is relatively very little appendicitis here. I do from 500 to 600 important surgical operations a year, but only six to eight appendectomies. Cancer of the intes-

tinal tract is quite rare (as are all forms of cancer), although ulcer of the stomach is common."

Dr. W. W. Peter, of Shanghai, says, "I never heard of appendicitis in a Chinaman."

The fact that cancer is a disease peculiar to advanced civilization is clearly shown by the replies received from one hundred and twelve physicians located in the following countries: Mexico, Palestine, Arabia, Turkey, Egypt, South Africa, East Africa, Central Africa, Nigeria, Japan, Syria, Korea, Persia, Siam, India, Asia Minor, New Hebrides. Forty-three of the one hundred and twelve reported that they had never seen cancer of the bowels. Nine physicians from different parts of Africa, the West Coast, Tunis, Nigeria, Rhodesia, Uganda, East Africa, British Central Africa, the Portuguese Congo and Belgian Congo all report having never seen a case of cancer of the bowels among the natives.

Primitive Remedies for Constipation

The following extracts from replies to our questionnaire illustrate the habits of people in relation to bowel movements and the simple but often highly sensible methods employed by them for relief:

“The chief duty of the Indleburds, or priestly caste, is the care of such matters (the movement of the bowels). A fine is levied in case of neglect.”—P. N. Darling, M. D., India.

The observation of Dr. Darling that one of the duties of the priest in India is to educate the people in reference to the proper care of the bowels is highly suggestive. In this country, the subject of bowel hygiene has been so universally neglected that even parents are quite ignorant concerning the bowel habits of their children and often allow them to drift into diseased conditions, the evil effects of which are felt throughout their entire lifetime. Physical, mental and moral evils resulting from constipation are so great that it is not an exaggeration to say that teachers, as well as preachers, could not make a better use

of a portion of their time and talents than by the education and training of the children in the proper care of the colon.

"The natives give prompt attention to the bowels. I have again and again had it given as a reason for not living in Aden, that people had there to go to the closet in order to evacuate their bowels, rather than relieve themselves any place, as this was only permitted for children."—John C. Young, M. D., Sheikh Othman, Aden.

The above observation by Dr. Young affords powerful testimony to the importance attached by the Arabs to the prompt response to the call of Nature for evacuation of the bowels.

Dr. Davidson, of Travancore, India, says: "Appendicitis very rare here. Only about six cases out of at least 1,000 major operations."

Dr. Davidson's experience in meeting only six cases of appendicitis among a thousand major operations is striking evidence of the rarity with which appendicitis occurs among non-flesh-eating people. This observation agrees with that of Dr. Senn, who noted the

absence of appendicitis among the vegetable-eating natives of the east coast of Africa. An examination of the annual report of the Mayo Clinic shows 19 per cent of all cases examined to be suffering from appendicitis, and at operation the appendix was found diseased, requiring removal in 21 per cent of all cases operated; whereas, Dr. Davidson found in India only six-tenths of one per cent, a frequency thirty-five times less.

“In cases of constipation or obstruction, very forcible measures are employed, such as massage, kneading the abdominal wall and exerting pressure upon the abdomen, and even kicking.”—E. Margaret Phillips, M. D., Ping Yin, China.

“Brown sugar is the laxative usually relied upon.”—Walter W. Williams, M. D., Yung-an Fookin Pwo., China.

The above observations in China and Turkey show the sagacity of primitive people in discovering simple food remedies for constipation. When taken in large quantities, sugar produces laxative effects, not only because of its specific stimulating effect upon the intestine but because of the stimulating effect of

the lactic acid produced by the fermentation of the sugar in the colon.

“For relief of constipation a sort of large rolling pin is freely rolled up and down the abdomen while the patient is lying supine.”—H. G. Barrie, M. D., Kuling, China.

The use of the rolling pin as a means of relieving constipation is an original Chinese invention, although a cannon ball, as well as various kinds of apparatus, have been long in use in this country as a means of mechanically stimulating the bowels to activity.

“They use a smooth stalk of millet to stimulate the lower bowel.”—Elizabeth Beatty, M. D., Kwangning, Manchuria, China.

Mechanical stimulation of the rectum has long been known to be a powerful means of exciting peristalsis, but the method is not to be recommended because of the danger of producing inflammation and infection leading to hemorrhoids, fissure or abscess.

“A very crude method for giving an enema is to take a small, slender piece of bamboo for a nozzle and a bag made of pig gut, and use it as a syringe.”—William M. Berss, M. D., Chenchow, South Hunan, China.

"They have no instruments, but often use honey suppositories."—W. H. Park, M. D., Soochow, China.

"They have a funnel-shaped enema which is being displaced by European bulb syringes."—J. Davidson Frazier, M. D., Resht, Persia.

"The people have few or no remedies, save the drinking of a large quantity of hot water, which they often do when conscious of the need, and with quite good effect."—H. W. Schwartz, M. D., Yokohama, Japan.

"Massage is employed; drugs very rarely."—Walter Virden, M. D., Rhodesia, South Africa.

"Enemata given in the knee-elbow position with a funnel made of a leaf, and a pipe made of a gourd or vegetable stump."—J. Howard Cook, M. D., Fort Portal, Uganda Protectorate, East Africa.

It is interesting to note that even the members of savage tribes are acquainted with the value of the enema and have been able to improvise means for the getting of water into the bowels. Some of the means employed are, like the above, very highly ingenious. It is

also interesting to learn from the observations of Dr. Cook of the employment of the kneelbow position by the natives of Uganda. The credit for the invention of the kneelbow position has been given to an American physician. It seems, however, that in this case, as in many other matters pertaining to physical welfare, our discoveries were anticipated by the natives of primitive tribes.

“Roots are sometimes cooked in water and given as an enema by means of an ox horn with perforated end—large quantity poured in. In the Northern Transvaal purgatives are not required. Enema appliances not known.”—Neil Macvicar, M. D., Lorendall, South Africa.

“The natives regularly use enemata, introduced with gourds.”—D. Robertson, M. D., Itu, South Nigeria.

“They have medicines for use as purgatives, and also use enemas, which are administered by means of a sort of gourd with long neck. The gourd is filled, and the water flows in by gravitation. The patient lies prone.”—E. C. Sirley, M. D., West Coast of Africa.

"The use of common soap passed up into the anus or some similar substance is often used by the natives of this country to overcome constipation."—W. O. Ballantine, M. D., Rahuri, Western India.

"Soap suppositories is a common native remedy; enemas are never used; they consider it shameful. Massage of the abdominal wall is practiced, too."—R. T. Cox, M. D., Persawan, Northern India.

The Hindu mother knows the value of the suppository as a remedy for infants as well as does the American mother. Experience is a wonderful teacher and in this school the most ignorant savage mother has just as good an opportunity to learn and make advancement as the mother in the most civilized land.

"A smack in the stomach with a colon spade is often used, and is invariably productive of a profuse and continued motion. Some of the hill tribes carry under the left armpit finely engraved brass tongs for the purpose of extracting in their entirety the masses of fecal matter. These are shaped by the women of the tribe, and are used in their war catapults in tribal warfare."—P. N. Darling, M. D., India.

This drastic method of stimulating bowel action may sometimes produce injury, but could not possibly be more productive of mischief than is the common, almost universal, use in all civilized countries of laxative mineral waters and drastic cathartic remedies of all sorts.

“The population generally deal largely in drastic purgatives. A man will take a month’s leave from work for nothing more than a course of purgation, often very severe.”—F. V. Thomas, M. D., Palwal, near Delhi, India.

This method of dealing with constipation could scarcely be more injurious than the continued use of stomach- and colon-irritating drugs. As Von Noorden well says, “nothing is so bad as the chronic use of laxative drugs.”

“The native position, squatting at stool, with front of thigh against the abdomen, encourages evacuations.”—W. J. Maule, M. D., Miraj, India.

The squatting position in moving the bowels appears to be universal among all people with the exception of those who call themselves civilized. It is singular, indeed,

that in relation to this most important function of the body the wildest and most unsophisticated natives are really in advance of the most highly civilized people. The value of the squatting position as a means of relieving the bowels has been recognized for years but the knowledge has had little influence upon the habits of the people in this particular. It is pointed out elsewhere in this work how the objectionable features of the ordinary closet seat may be overcome by elevating the feet upon a stool eight or ten inches high placed in front of the closet seat.

“The position in which the native helps his expulsion of feces from colon and rectum is this: he sits on his haunches and presses the left side of the lower abdomen with the hand or a bunch of cloth.”—T. Davidson, M. D., South Travancore, South India.

The practice above referred to by Doctor Davidson is interesting evidence of the East Indian's capacity for intelligent observation. The descending colon and pelvic colon are located in the lower left side of the abdomen and pressure just at this point may be of the greatest value in aiding evacuation of the

bowels. The writer has for many years recommended patients to assist themselves when necessary by pressing firmly with the closed fist or with both fists upon the left side of the lower abdomen. Deep pressure made at this point will often arouse the lower bowel to immediate action, causing instantaneous expulsion of gas and, in many cases, within a few seconds a large evacuation of retained fecal matters. The use of a bunch of cloth for the purpose of increasing the pressure is an original invention of the East Indian and is highly suggestive. A patient recently reported to the writer the discovery that a newspaper folded into a round mass serves an excellent purpose for making compression over the pelvic colon.

“The use of a piece of oiled soap is common, which may have been learned from the English; and oiled rag is used, too.”—A Missionary Physician of India.

For more than thirty years, the writer has made occasional use of an oiled ball of cotton or of a cheese cloth pledget saturated with oil and placed in the rectum at night in certain forms of constipation.

"The chief practice is the habit of squatting at stool. Have had patients leave the Hospital because they could not have a normal movement without their own kind of commode. Complaints ceased with a native place provided."—Belle J. Allen, M. D., Baroda Camp, P. O., India.

An opening in the floor over which the user squats is the provision made for bowel évacuation in many parts of France, as well as in Oriental countries. Even in Paris, as recently as thirty years ago, the writer found this arrangement in use in the small hotels in the suburbs of the city. It is interesting to note that Dr. Allen's patients were willing to forego the advantages of hospital care rather than suffer the serious consequences of disturbed bowel action from interference with the normal mode of defecation.

A missionary physician writing us from South Africa related the following incident as an illustration of the care which the natives take to secure free movement of the bowels. Said the doctor, "A native called on me yesterday morning and asked for medicine to relieve a dreadful constipation. I said to him,

"When did your bowels move last?" He replied, "This morning, Doctor." "But I understood you to say you were constipated." "Yes," replied the native, "I am horribly constipated. My bowels only move once a day."

Since the publication of the first edition of this work the writer has learned from Doctor Wilfred Grenfell, of Labrador, that it is the custom in that country to feed reindeer moss to the sled dogs. After mixing with oil, the moss is eaten by the dogs with great avidity and they appear to thrive upon it. It is strange, indeed, that civilized man should be about the only creature among the members of the animal kingdom who neglects to supply his alimentary canal with the material necessary to furnish to the intestine the normal stimulus to action. In civilization, domestic animals fare better than human beings in this regard. When the horse, ox, or cow loses appetite and becomes constipated, bran mash is the farmer's ready and efficient remedy. But, strange to say, the farmer never thinks of giving himself the benefit of this simple and natural remedy, but instead dopes himself with purgative pills or mineral waters which ruin

his digestion, spoil his kidneys, increase constipation, and ultimately induce colitis, one of the most common and most formidable of all the evil effects produced by constipation.

The Colon Code

1. Move the bowels three times a day.
2. Answer the "call," even the slightest, at once. Delay of five or ten minutes may be disastrous.
3. Give the bowels an opportunity for evacuation on rising, at bedtime, and after each meal, even if there is no call.
4. Allow sufficient time for complete and thorough evacuation of the colon.
5. If the "call" returns after a movement, make a second visit to the toilet.
6. Place a stool in front of the closet seat to raise the feet.
7. Eat laxative food at every meal. A single omission may upset the bowel rhythm for several days.
8. If necessary, to secure three full evacuations daily, take two tablespoonfuls of bran, or one-third of an ounce of agar-agar, and half

an ounce to an ounce of white Russian paraffin oil at each meal.

9. Eat regularly and avoid fine flour breadstuffs and other concentrated foods.

10. Change the intestinal flora by the fruit regimen with lacto-dextrin. The constipation will not be permanently cured so long as the stools are putrescent or very foul smelling.

11. Drink two or three quarts of water daily, one or two glasses of cold water at bedtime and the same on rising.

12. Take deep breathing and abdominal exercises daily. (See Index.)

13. Wear loose clothing and if the abdomen sags wear a spring supporter constantly when on the feet.

Many persons suffer from stasis, that is, delay of the food residues in the colon, without being aware of the fact. The bowels are regular, moving daily, or perhaps several times a day, and yet it may be shown by suitable tests that decomposing food residues and body wastes are retained in the upper portions of the colon for two or three days, or even longer. Even in so-called cases of diarrhœa, stasis, which is even worse than ordinary con-

stipation, is nearly always present. In such cases, the cecum is dilated or crippled, and has become a cesspool which ever overflows, but is never emptied without the use of cathartics or an enema, and even these are not always successful.

14. If the bowels do not move well and feel full, take an enema at night of warm water (100° F.), three or four pints. This will do no harm and will not interfere with the morning after-breakfast movement.

15. A small enema (half pint) of warm water at bedtime, retained overnight, often secures a good morning movement. An enema of a few ounces of paraffin oil (four to six) may be used to combat dryness of the stool.

16. In many cases of colitis, with spastic contraction of the descending or pelvic colon, a complete movement rarely occurs. The feces are slowly pushed through the constricted bowel. In such cases, what may be termed supplementary bowel movements are necessary. A few minutes after the movement, or it may be an hour after, a slight "call" may be experienced. This should be responded to at once, and even if the call is

repeated. When the bowels do not move satisfactorily, it is well to wait for several minutes, meantime occupying the mind with reading the morning paper, perhaps. This affords time for a new instalment of waste material to be pushed down from the upper part of the colon.

17. A very hot sitz bath for two to five minutes, or a hot fomentation, taken before breakfast, is an excellent means of relaxing the contracted colon in cases of colitis, and so preparing the bowel for a good after-breakfast evacuation.

18. Fruit on rising, and on going to bed, may be taken when necessary as an aid to other measures. One or two oranges, an apple, a couple of plums, or a dish of berries eaten without cream (malt sugar may be added), or a bunch of fresh grapes are suitable for this purpose. The fruits named do not tax the digestive organs because they contain no fat, very little protein, and no raw starch, the starch having been digested by the process of ripening. They are all rich in vitamins and highly refreshing. When taken into the stomach, they induce a lively peri-

stalsis; which is continued down the intestine and helps to advance the fecal mass toward the point of exit. The fruit taken on rising helps to secure a full bowel movement after breakfast. The fruit at bedtime prepares the way for a bowel evacuation on rising.

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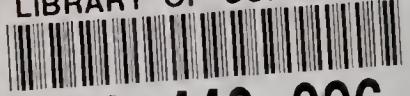
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